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FOREIGN ESSAYS
ON
AGRICULTURE and ARTS.

CONSISTING CHIEFLY

Of the MOST CURIOUS DISCOVERIES made in
the ſeveral PROVINCES of

FRANCE,
GERMANY,
FLANDERS,
SWEDEN,
ITALY,
SWITZERLAND, &c.

AND

Communicated by the LEARNED in thoſe COUNTRIES

For the Improvement of

BRITISH HUSBANDRY.

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BRITISH MUSEUM
8 JAN 35

TO THE

PUBLIC.

THOUGH our own country has an undoubted claim to pre-eminence in Agriculture, yet we muſt acknowledge that other nations have made diſcoveries in this ſcience worthy our moſt ſerious attention; and, what is particularly commendable in moſt foreigners (as well as in our own countrymen), a deſire of propagating uſeful knowledge generally prompts them to communicate their diſcoveries to the world.

This propenſity of diffuſing inſtruction brought to light the labours of a Linnæus, a Du Hamel, a Turbilly, a Chateauvieux, a Tillet, a D'Ambourney, and many others, whoſe works, though founded on ſound philoſophy, confirmed by experiment, and ſtudied with avidity abroad, are but little known here, eſpecially to thoſe who ſtand in moſt need of ſuch aſſiſtance; and this is owing not perhaps ſo much to the ſize and price of the volumes, as to their being written in languages unintelligible to thoſe who are engaged in the practice of Agriculture. This has likewiſe deprived the Engliſh Huſbandman and Gardener of the diſcoveries made by foreign ſocieties eſtabliſhed for the improvement of Agriculture and Arts; for however great their benevolence, or valuable their reſearches, both are rendered uſeleſs to our Farmer and Mechanic, while theſe works are concealed in languages with which the reader is totally unacquainted.

It is our intention therefore to ſelect and tranſlate the moſt valuable papers from the memoirs and tranſactions of theſe ſocieties, together with ſuch fugitive pieces as are conſiſtent with the deſign of the work, which will be publiſhed occaſionally, for the uſe of ſuch of our countrymen as are engaged in theſe purſuits. To theſe materials, we ſhall frequently add ſome papers, which have been tranſmitted to us from many learned foreigners, who have honoured us with their correſpondence.

So wonderful are the productions of Nature, ſo inexhauſtible her treaſures, and her operations, though uniform, ſo multifarious, that it has required the united efforts of the learned to explore even a ſmall portion of her ſecrets. Thoſe who have read the annals of the world, and carefully noted the progreſs made in the ſtudy of Agriculture only, will perceive, that more real diſcoveries and improvements have been made in the courſe of the preſent century, than were effected for ſome thouſand years before; and this we may conſider as a conſequence of the eſtabliſhment of the ſocieties above-mentioned, and of the benevolence and chearfulneſs with which men of genius have aſſiſted each other in their reſearches.

A general communication of this kind may anſwer a twofold purpoſe; while we derive advantages from the improved practice of foreigners, we may be benefited even by their miſtakes. Their uſeful improvements may be adopted, their errors avoided, and ſome methods of Huſbandry, which they have too haſtily received, and but aukwardly put in practice, may with a few amendments, or neceſſary cautions, be made eſſentially uſeful. For this reaſon, we ſhall refuſe a place to no candid and judicious remarks, or ſtrictures that may be ſent us, on any of the pieces we ſhall publiſh; nor reject any tranſlation we may receive, if it be coincident with our deſign, and in itſelf curious and uſeful.

To obviate an objection, which may poſſibly ariſe, we muſt obſerve, that the Public is already poſſeſſed of one periodical work on this ſubject, the merits of which we are neither inclined to diſpute nor ſuppreſs; but as that work is confined to domeſtic Huſbandry only, we apprehend there is ſtill room for this publication, which is eſſentially different; and that particularly at a time when all haſten for improvement. When Gentlemen prudently recommend new and uſeful diſcoveries by ſetting their Tenants an example, and when even common Farmers read for inſtruction, a pamphlet, collecting the experience of the learned and laborious in foreign countries, cannot be unacceptable.

We have only to add, that whenever the tranſlators think it neceſſary to make any obſervations, remarks, or explanations, they will, for the ſake of diſtinction, be inſerted between crotchets.

FOREIGN ESSAYS, &c.

ARTICLE I.

An account of an experiment, to aſcertain the difference betwixt the wool of ſheep folded abroad during the winter, and of ſheep kept under cover in that ſeaſon.

MADE BY THE ORDER OF

Monſieur DE BROU,

INTENDANT of the GENERALITÉ of ROUEN, in NORMANDY.

THE experiments made from the year 1757 to 1760, in the Generalité of Rouen, to aſcertain the advantages or diſadvantages of folding ſheep abroad during the winter, inſtead of ſhutting them up in the covered fold, left no room to doubt, but that the ſheep folded abroad were more healthy and ſtronger than the others, and that their fleeces were finer, ſofter, and whiter.

Theſe experiments were repeated in a greater number in the winter of the year 1760, (which was one of the ſevereſt that is remembered ſince 1709, M. de Reaumur's thermometer falling twelve degrees and a half below the freezing point) and they were attended with the like ſucceſs. Some of the ewes dropped their lambs in this ſevere weather, without damage to either, though they were left in the open air; on the contrary, theſe lambs were ſtronger in the ſpring, than thoſe dropped by ſome ſheep of the ſame flock, which were kept in the covered fold; this proves, that nothing can be better for ſheep than to keep them abroad.

The next point is to aſcertain the degree of ſuperiority, which is poſſeſſed by the wool of ſheep folded abroad, compared to that of ſheep kept all the winter in the covered fold.

M. de Brou, Intendant of the Generalité of Rouen, engaged ſometime ſince a ſenſible and intelligent artiſt to make the experiment, under the inſpection of another perſon. This experiment anſwered in every point, ſo that they were ſorry they had not made it more in large.

It has been ſince repeated with all due attention to circumſtances, and the reſult is as follows.

EXPERIMENT.

Thirty four pounds twelve ounces of wool of ſheep folded abroad were taken, which wool being pulled, was afterwards beat on a hurdle to get out the duſt.

In theſe operations it loſt in weight ten pounds four ounces, that is to ſay, eight pounds thirteen ounces in the picking and pulling, and one pound ſeven ounces in the beating; ſo that there remained only twenty-four pounds eight ounces.

The like quantity was taken of the wool of ſheep kept in the covered fold, which in the ſame operations loſt eight pounds twelve ounces, that is to ſay, ſeven pounds twelve ounces in picking and pulling, and one pound in beating, ſo that there remained twenty-ſix pounds, or one pound eight ounces more than of the other wool; it will, however, be found in the ſequel, that there is upon the whole leſs waſte in the wool of the ſheep folded abroad, than in the other.

[By ſome experiments ſince made, it is found that the fleeces of the ſheep folded abroad are conſiderably finer and heavier, than thoſe of ſheep ſheltered during the winter ſeaſon; the firſt mentioned ſheep having about a fourth part more wool on them.]

When this was done it was obſervable, that the wool of the ſheep folded abroad appeared whiter, leſs dry, and ſomething finer grained than the other.

Twenty-three pounds of each of theſe ſorts of wool were combed and ſpun for the warp, and ſix pounds of oil were uſed to each quantity. The wool of the ſheep folded abroad, yielded nineteen pounds of thread, and the other wool ſixteen pounds, that is, three pounds leſs; and it was alſo obſerved, that the thread of the laſt was ſomething coarſer than the other.

For the woof, thirty pounds of the wool of the ſheep folded abroad were taken, which being beat, picked, and pulled, there were ſix pounds eight ounces waſte, that is to ſay, four pounds in the picking and pulling, and two pounds eight ounces in the beating, ſo that there remained twenty-three pounds eight ounces.

In like manner thirty pounds of the other wool were taken; and there were nine pounds eight ounces waſte in the picking and pulling and beating, that is to ſay ſix pounds eight ounces in the picking, and three pounds in the beating; ſo that there remained neat only twenty pounds eight ounces, being three pounds leſs than the firſt mentioned wool produced.

That the weight might be equal eight ounces were added to one, and three pounds eight ounces to the other, ſo that there were twenty four pounds of each.

Theſe parcels were delivered to be carded and ſpun, after having been each greaſed with five pounds of oyl. When they were ſpun they each weighed twenty ſeven pounds, but the thread of the wool from the Sheep folded abroad was ſomewhat finer, than the other in the proportion of 74250 to 69750 which was evident from the length of thread each produced. It is to be noted that both parcels were carded and ſpun by the ſame perſon.

In order to weave this into ſtuff, ſeventeen pounds eight ounces of the warp ſpun from the wool of the Sheep folded abroad was put into the loom, the width conſiſted of 1134 threads, this took eighteen pounds ten ounces of the wool, and the piece was thirty two ells and a half long, and an ell wide within a thirty ſecond part.

This piece of ſtuff after having undergone the various operations requiſite to dreſs it, was reduced to the length of twenty five ells and a half, and was in width only five eighths of an ell.

The thread ſpun from the other ſort of wool having been managed in the ſame manner, the piece of ſtuff wove from it, after being dreſſed was only twenty four ells and a quarterlong, and five eighths of an ell broad; ſo that it was an ell and a quarter ſhorter than the piece made from the wool of the ſheep folded abroad.

OBSERVATIONS on this EXPERIMENT.

[The principal motive for laying this paper before the Engliſh reader, is to convince him, that the old method of folding ſheep abroad is by far the beſt. Our huſbandry, tho' better practiſed than perhaps in any part of Europe, will ſtill admit of great improvements; yet ſhould we not be too fond of every new ſcheme offered to our notice. Covered folds have been of late recommended under a notion that the dung ſaved in this manner, might be more profitably applied to uſe, than when it is as it were indiſcriminately ſcattered from the tails of the ſheep, and it has been alſo ſuggeſted that the fleeces would become finer by the help of the covered fold, as the ſheep would perſpire more, but the above experiment entirely controverts this opinion, and as to what relates to the dung, we are convinced it is in the manner we now apply it a good manure, and as we are not ſure it would turn out to more advantage when ſaved in a covered fold, it would be madneſs to adopt that practiſe when we know, or may know at leaſt, that by leſſening the wool both in quality and quantity we ſhould be certainly looſers by it.]

Every part of this experiment was conducted with the greateſt care and attention, and by the ſame perſons. By the account which has been juſt given, it ſhould ſeem that the wool of the ſheep folded abroad is to be preferred. This wool was at firſt finer and ſofter, there was leſs waſte in working it, and the thread was alſo when ſpun finer than the other: theſe are eſſential advantages.

The ſtuff made of the wool of the ſheep folded abroad was an ell and a quarter longer than the other, and was alſo finer and whiter: this difference was very eaſy to be perceived. We may reaſonably then conclude, that folding ſheep abroad improves their wool greatly.

If we adopt this practice which is common in England, we may have reaſon to hope that our wools will every year be finer and ſofter; yet as a great deal depends on the breed of the ſheep, it were to be wiſhed that we could get ſome Spaniſh and Engliſh ſheep to breed from. Mr. de Brou is very willing to encourage thoſe who may import ſuch ſheep and will reward them in proportion to the number they bring into his Generalité.

[We ſee by the laſt paragraph that our neighbours and natural rivals are making every poſſible attempt to aggrandize themſelves at our expence; they even offer rewards for tranſporting live ſheep from England though contrary to our laws; ſhould we not then exert ourſelves to the utmoſt leſt they at laſt carry their point; let us apply diligently to the improvement of agriculture, and an encreaſed trade muſt be the conſequence.]

* * *

ARTICLE II.

An Eſſay on the Lentil of Canada, preferred to all other pulſe for feeding horſes and black cattle, the culture of which is lately introduced in France, by

M. Dumesnil Costé *of* Normandy.

I HAD ſent me from Canada a kind of ſeed, which may be called a lentil ſeed. It is a ſpecies of vetch, with white ſeeds inclining to yellow, ſomewhat reſembling garden peas when they are dry.

The ſeed is round, yet a little flatter than the ſeed of the vetch, its ſhape, leaf, and flower, exactly reſemble the common vetch.

It ſupplies the Canadians with a ſweet and wholeſome food. By cultivating it in Europe, many advantages would accrue; it would be very uſeful when bread was dear, and would ſupply the poor with a kind of food, as wholeſome as it would be cheap. It is beſides an excellent fodder for horſes and other cattle,

A ſmall quantity of this ſeed would ſupport a man, and there are many ways of preparing it for food.

This plant requires no other culture, than what is beſtowed on field-peas and vetchs, being ſown in April in the open field.

Many experiments have been made on the culture of this plant, by ſeveral gentlemen to whom I gave the ſeed.

Mr. Fiquet in the ſpring of the year 1762, ſowed a handful of it in his garden at Normanville, in the diſtrict of Caux; it yielded him a return of forty-eight for one, and he had beſides two large bundles of fodder, which was fine, tender, and exceedingly well adapted to the feeding of horſes and cattle.

This is an evident proof, that the lentil of Canada yields an encreaſe abundantly larger than any other plant cultivated in the open field.

A part of theſe lentils was ſent to the kitchen to be boiled, and it was found they boiled readily, had the ſame taſte as the beſt common lentils, and were as eaſy of digeſtion.

M. Touſtain de Fronteſboſc, cauſed a middling handful of theſe lentils to be ſown in a bed of his kitchen garden at Limeſy in the diſtrict of Caux. It was in the month of April 1762, and the quantity of ground might be about half a rod.

By the month of September when the crop was cut, the plants had attained the height of five feet and upwards, making three quarters of a ſheaf ſuch as are made in that diſtrict, which generally meaſure five feet and a half in circumference, are hard bound, and commonly weigh immediately after mowing from thirty five to forty pounds, though when dry they are reduced to 25 or 28 pounds.

This ſheaf yielded a large increaſe, and ſome of the ſeed being offered to horſes was greedily eaten by them. The produce of it was near half a peck of ſeed.

Monſieur Touſtain has made the following remarks on the occaſion.

"This lentil was not attacked by the fly, which at the ſame time devoured all the peas and vetches in the diſtrict of Caux. This advantage which the Canada lentil has over the ſorts of pulſe I have mentioned, is of great conſequence.

"Suppoſing half a rod or perch of land produced as above three quarters of a ſheaf, an acre of land containing an hundred and ſixty perches, would of courſe yield two hundred and forty ſheaves.

"It is probable, however, that the product of this lentill would not be ſo conſiderable if it was ſown in the open field; yet it is to be preſumed it would produce more than either peaſe or vetches, which in the above diſtrict in the moſt favourable years do not yield more than about one hundred and forty ſheaves on an acre.

"This lentil produces more cods, or pods than the common vetch; the three quarters of a ſheaf yielded near half a peck of ſeed, of courſe eight ſheaves at moſt would yield a buſhel, whilſt above a dozen ſheaves of peas or vetches go to produce a buſhel of ſeed.

"It is to be preſumed, that this lentil would yield in the ſame proportion more than peas or vetches, if it was ſown in the open field; the earth there being leſs divided, and abounding leſs in vegetative juices than in a kitchen garden, the plant would not grow ſo high, but running leſs to ſtalk would produce more ſeed.

"The nature and quality of the ſeed conſtituting the principal excellence of fodders, this lentil, which is ſweet and pleaſant to the taſte, ſhould of courſe be more wholeſome to cattle than other kinds of pulſe, and ought to be preferred to them, particularly in ſuch countries as have not a ſoil well adapted to grey peas, ſuch as the diſtrict of Caux, where they generally ſow a third part, or even half the quantity of vetches with their peas.

The grey pea is in flavour greatly inferior to the lentil, and the taſte of the vetch is bitter and diſagreeable; and it not unfrequently happens that horſes which are fed in the ſtable with vetches alone, loſe their hair in winter.

The people of Flanders, who are very good farmers, and breed a great number of horſes for ſale, are accuſtomed in ſome of the provinces to feed them with a ſmall lentil much cultivated there, but which is probably greatly inferior to the Canada lentil.

To conclude, if this plant poſſeſſes ſuch advantages, with regard to its being ſo well adapted to the feeding of cattle, and to its large produce; it alſo preſents to our conſideration another benefit much more worthy our attention, affording an excellent food for the poor; this property which tares and other ſuch kind of pulſe enjoy not, gives the Canada lentil the ſame ſuperiority over them, as wheat has over rye, barley, oats, and other grain, in value and price.

So many advantages poſſeſſed by this lentil ſhould certainly induce our farmers to cultivate it, and after the reſult of theſe experiments, which were made with great care and exactneſs, they cannot doubt of ſucceſs; and if they do ſucceed on an extended cultivation, the Canada lentil will probably be ſubſtituted to every other kind of pulſe now ſown in the field.

Meſſ. Touſtain de Frontebosc and Fiquet will not reſt ſatisfied with the ſucceſs they have had in cultivating this lentil in their gardens; they intend, like lovers of their country, to try what may be expected from the culture of this plant in the open field, that they may extend the uſe of it to feeding horſes and other cattle.

They have been even induced to attempt ſowing a ſmall quantity of this ſeed in the month of October, a gentleman having obſerved ſome plants of this lentil remain, during the whole winter, in his garden, without being ever attended to, and come to maturity in the month of May following.

The ſucceſs of this experiment would give us a new winter lentil, which we ſhould value the more, as it would be forwarder than any other kind of fodder, and might even be an intermediate crop.

[The writer of this eſſay means by intermediate crop, that this lentil might be ſown ſoon after harveſt, and be got in early enough to ſow ſpring corn in May. How far this is practicable in our climate, experience will beſt inform us.]

ARTICLE III.

A treatiſe on Lodged Corn, with the means of preventing that misfortune; *written by* M. J. BERTRAND *of* SWITZERLAND.

A FRIEND of mine, who is a great lover of huſbandry, aſked me what he ſhould do, and what precautions he ſhould take to prevent his corn from lodging, or being laid. His land is very rich, and yields great crops, yet is it ſubject to this misfortune.

I preſcribed to him the remedies which I am now about to lay before the reader. The ſubject is in itſelf of great importance.

Many farmers who are poſſeſſed of prime land, ſuffer very conſiderable loſſes, by the quantity of corn which they have yearly lodged; for the ears that fall ſcarcely ever ripen or perfect the grain, which is in this caſe generally ſmall, ſhrivelled, and ſtarved, the veſſels in the ſtalk being obſtructed, the free courſe of the ſap is conſequently impeded, if not totally ſtopped.

In theſe rich lands, the cauſe of this misfortune is their being too free of their nouriſhing or vegetative qualities. Though the ſtalks of corn are ever ſo well nouriſhed, yet when they have not a ſufficient elaſticity, if they have imbibed too much moiſture, or that the heat is not great enough to dry them, and continually extract the ſuperfluous watery particles, as ſoon as the corn ſpindles, the ſtalks not having conſiſtence enough to keep themſelves erect, bend eaſily with every high wind, or whenever the large blades are wet with dew or rain.

This is the cauſe of the diſaſter: the remedies follow.

I. It is abſolutely neceſſary that the land ſhould be cleared of all ſuperfluous water, at leaſt as much as poſſible, either by making open ditches or covered drains, deep enough for the plow to go ſafely over them. If ſtones are not at hand to put into theſe drains, ſmall faggots, or any kind of bruſhwood may ſerve, but the faggots will do beſt, and laſt longeſt, if cut in the winter ſeaſon.

Theſe are be laid at the bottom of the trenches, over them ſtraw, and laſtly the earth.

If the ground has a natural ſlope, it muſt be humoured in making theſe covered drains, and the water muſt have an eaſy fall.

II. Theſe lands are always beſt plowed high, even in ridges, or in narrow high raiſed ſtitches, according as the ſoil is more or leſs damp.

III. If the field has a ſlope, the furrows muſt not either croſs it horrizontally, or go up and down, but they muſt have an eaſy fall obliquely down, ſo that the water may run gently off without carrying away the fine earth, or the vegetative particles which are mixed with it.

When land is thus circumſtanced, this precaution is abſolutely neceſſary, ſo that it cannot with any degree of prudence be neglected.

IV. The farmer muſt not be ſparing of his water-furrows, and they muſt be ſo diſpoſed as beſt to anſwer the purpoſe for which they are intended.

V. By plowing deep the ſuperfluous moiſture is naturally carried downward, and the roots of the plants, inſtead of being ſurſeited with it, are only gently moiſtened, and moderately refreſhed.

VI. The deep autumnal plowing, in which the furrows ſhould, if poſſible, be drawn from eaſt to weſt, and the ſummer croſs plowing, may alſo much contribute to prevent this misfortune, by promoting the attenuation, or diviſion of the particles of earth.

VII. Such lands as theſe muſt in particular never be plowed in rainy weather, or when they are wet, though they ſhould not even be wet enough to riſe in clods. It is much better to defer the plowing ſome time longer, even if the farmer ſhould be obliged to give the two laſt plowings, one after the other, ſucceſſively, without any intermediate ſpace of time being allowed.

In theſe rich lands we ſhall do well to remember Virgil's precept of plowing and ſowing dry; if we do not, our corn will not only be in great danger of lodging, but may probably alſo be ſmutted, for rich lands are moſt ſubject to the ſmut.

VIII. When the froſts come on, and the earth is full of water, the wheat is lifted, more or leſs, out of the ground; this weakens the plant, by expoſing ſome of its roots to the air; indeed they are often totally uncovered.

This may be remedied, by paſſing a heavy roller over the corn in dry weather in the ſpring of the year; but then the field ſhould have been deep plowed. Nevertheleſs, if the corn ſhould ſtand in need of being weeded, which, however, it never ſhould do, the rolling may be diſpenſed with; the weeders will earth up the plants ſufficiently, by walking over the land, and plucking up the pernicious inmates.

IX. When wheat is too ſtrong and vigorous in the ſpring of the year, it will infallibly be lodged before harveſt. The corn in this caſe will find moiſture in abundance, but too little true vegetative nouriſhment. Tull recommends, that the plants ſhould, when this happens, be thined, either by hand, or with a weeding-hook; this anſwers well, but it is expenſive.

I ſaw a field in the year 1760, where the wheat plants came up much too thick. In the ſpring a harrow was drawn over one half of it. The weather was cloudy, and the earth rather dry than moiſt.

At harveſt-time, the crop of this part was much more conſiderable, than on that which had not been harrowed. I am apt to think this method is better than mowing wheat in the ſpring, or feeding it down with ſheep.

It is true, in the latter caſes, the wheat will not be lodged, but then there will be a great number of barren ears; they make, indeed, a fine appearance whilſt growing; but examine them, and you will find numbers of the cheſts empty, and without any grain in them.

This may be depended on, as I write from experience.

X. I would not bury the ſeed ſo deep in moiſt ſoils, as I would in thoſe which are drier. This at leaſt is certain, trees planted deep in ſuch ſoils do not thrive.

XI. All hot manures, ſuch as the calcarious earths, and abſorbent ſubſtances, aſhes, ſoot, tanner's bark, brick rubbiſh, burnt clay, lime, rubbiſh from old buildings, ſhells, and ſhell marle, agree extremely well with ſuch lands as thoſe I have mentioned above.

The manure, however, ſhould be laid on ſparingly, be well ſpread, and equally diſperſed all over the land; in moiſt ſoils it waſtes ſlowly.

XII. I ſhould be willing to try, whether ſuch land might not be plowed and cropped for ſeveral ſucceſſive years without reſting.

If the farmer has plenty of dung, he might very ſafely ſow alternately wheat, rye, or bere, and the ſeveral ſorts of ſpring corn, provided he always plowed up his eddiſh immediately after harveſt, and the fallows might be ſown with cole ſeed, turnips, or planted with madder, if the farmer did not think it would too much impoveriſh his land.

XIII. On theſe rich lands it has been for ſome years the cuſtom to ſow winter barley, or maſlin, for the ſecond crop, inſtead of ſpring corn; and this, I think, for many reaſons good huſbandry.

My opinion is, that the ſquare barley, big, or bere, is a more profitable crop than ſummer barley or oats; and tares alſo yield an excellent fodder. But if the farmers, who prefer theſe crops, ſhould attempt to ſow them on one earth, they will do wrong, and ſuffer accordingly, as this is never done by the good huſbandmen, whoſe example they would wiſh to follow. Two earths at leaſt muſt be allowed, the firſt plowing to be given immediately after harveſt. The ſtubble being buried, ſerves as a manure, and is ready carried on to the field.

The ſecond plowing is for the ſeed earth; and, if the ſeaſon ſhould be ſo unfavourable, as to prevent the land from being plowed immediately after harveſt, the plowing may be deferred, without any bad conſequences, till it is convenient, even till near ſeed time, when the two plowings may be given at one and the ſame time, provided the farmer has the precaution to burn the ſtubble.

If two earths were not in this caſe allowed, the ſoil would be much more impoveriſhed, and would not be by far ſo replete with vegetative juices; by which means the corn would be weakened, and the ſtalks would not have that ſpringyneſs, which is ſo requiſite to them.

XIV. A careful ſteeping of the ſeed will alſo in ſome ſort be a prevention to this misfortune. Good ſeed, well choſen, changed from time to time, and carefully prepared, produces plants that are more vigorous, ſtronger, and better conditioned, than when theſe precautions are omitted; there is nothing more certain than this.

Yet a modern writer (the piece here refered to, was publiſhed in the tranſactions of the Bern ſociety) willing, as he ſays, to reduce agriculture to its firſt principles, thinks very differently.

Under the head of ſowing, he advances ſeveral paradoxes contrary to the experience of all farmers in all countries.

In the firſt place he pretends, that wheat intended for ſeed ſhould be cut green, ſaying, that no flour is wanted from this corn.

Secondly he aſſerts, that it is ſufficient ſimply to change the ſeed, by buying it chance medley in the market, without making any enquiry about the place of its growth, &c.

Laſtly, he ſays, it is quite unneceſſary to give any preparation to the ſeed, to promote its firſt ſhoot.

But who will believe that a germ half formed, can give birth to a perfect grain; and that a grain which has not arrived at a ſtate of maturity, can ſupply its germ and radicles with the quantity of nouriſhment, they will in the infant growth of the plant have occaſion for?

Who will be perſuaded, that a change of ſeed made in the negligent manner this writer mentions, can be of any great uſe? neither does he aſſign any reaſons in ſupport of theſe his extraordinary maxims, which are entirely different from the practice of every prudent farmer, and the gardeners, who are ſuppoſed to underſtand beſt the refined parts of huſbandry, adopt quite contrary maxims.

This writer does not, it is true, abſolutely deny the good effects reſulting from the preparation of the ſeed, according to ſome experiments lately made, in haſtening the germination, guarding againſt the depredations of inſects, and defending the crop from the ſmut, but he makes very light of their aſſertions, who ſay that the ſmall quantity of aſhes and lime uſed in ſteeps, can any ways conduce to ſtrengthen the plants, or augment their produce.

It cannot be denied, even by this writer, that the lobes and radicle of the ſeed at its firſt devolopement are eaſily affected, either one way or the other, to their injury or benefit? Theſe parts are at that period ſo very weak and delicate, that a triffling quantity of ſalts and abſorbents may have a laſting effect on them; and it is univerſally acknowledged that the future well being, as well of plants as of animals, in a great meaſure depends on the firſt nouriſhment that is given them, and the firſt care and attention that is beſtowed on them.

But to have done with this ſeeming digreſſion.

XV. In rich ſoils the ſeed ſhould be thinly ſpread on the land, if the farmer would ſecure his crop from being lodged.

When corn comes up too cloſe and thick, the crop often abounds more in ſtraw than grain, and the beſt of ſoils will yield but a ſmall increaſe, when the plants ſtand ſo cloſe as to ſtarve and choke one another, for they muſt then be all in a languiſhing feeble ſtate; but if on the contrary, the farmer is on ſuch ſoils ſparing of his ſeed, the wheat will have room to branch and ſpread, the ſtalks will be ſtrong and vigorous, and the crop will ſupport itſelf ſtiffly againſt the wind.

Nothing is more eaſy than to aſcertain the quantity of ſeed which a field will require.

The beſt way is to make ſome ſmall experiments, in order to judge how much the quantity uſually ſown may be ſafely diminiſhed. Chuſe a well prepared piece of ground, ſow one part of it thin, and the other thick, and compare the crop of each with the other.

By repeated experiments on various ſoils, the farmer may ſoon learn, without riſking any great matter, how much ſeed the ſeveral kinds require.

XVI. Early ſowing may alſo contribute to the prevention of this evil.

When the exterior parts of the plant are ſtopped in their progreſs by the cold, and their growth checked by the ſnow and froſt, the minute interior parts, the roots, the fibres, and the mouths by which they extract their nouriſhment, are ſtrengthened and increaſed in proportion to the degree of vigour and ſtrength which the plant poſſeſſes, and enabled by this means to put forth in due ſeaſon, ſtalks that will not give way to every blaſt of wind.

XVII. The right of commonage claimed in many parts, contributes in ſeveral reſpects to weaken the ſtraw of wheat. The farmer, fettered by a ſavage and unjuſtifiable cuſtom, cannot till his field when he pleaſes, nor huſband it in the manner he thinks beſt.

He cannot plow in the ſtubble immediately after harveſt, to ſow winter barley; he is not permitted to ſow turnips when his crop is off; he muſt not turn up his ſtubble before the winter, to prepare the land for the reception of the ſpring corn; he muſt not plow his fallows early in the ſpring; and, indeed, it ſhould ſeem that the more care he takes to get his lands into proper tilth, the more are they poached, trampled on, and ſpoiled by the permiſſion which this barbarous cuſtom gives the commoners of turning cattle on at all times of the year, but when the lands are in crop, even when they are covered with water. It is certainly then ardently to to be wiſhed that this evil was totally removed.

XVIII. Sometimes wheat will be lodged on account of its ſuffering from froſt, or ſnow, in the ſpring; or from the water which has formed lodgements in the flats.

When froſt comes after plants have made their ſpring ſhoot, it breaks their delicate fibres, and obſtructs their veſſels, particularly if they are in a moiſt ſituation. This naturally weakens them, and hurts their future growth.

To prevent this, the furrows of the ſeed earth ſhould be, if poſſible, drawn from north to ſouth, and the land ſhould be ſo diſpoſed that the water may not any where find a lodgment.

XIX. Wheat is alſo lodged in certain places on account of its being ſurrounded by bogs or woods, from whence at all times there ariſe cold vapours, which every now and then retard, or entirely ſuſpend the courſe of the ſap, and check the vegetation.

The remedies here are draining the bogs, and cutting down the woods, from whence theſe peſtilential vapours are exhaled.

XX. The beſt land is ſometimes ſubject to have lodged corn, by being expoſed to certain ſtrong winds. Such fields ſhould be ſheltered by high quick hedges, or by trees planted on the ſide whence the winds blow.

It cannot eſcape the notice of the reader, that in theſe obſervations I have paſſed over all poor light lands, as on ſuch the farmer can never expect to have ſtrong wheat.

This evil may however, even on ſuch land be in part guarded againſt, by laying the ſeed three inches deep, by deep plowing, by dreſſing it only with ſtrong manures, and very rotten dung, by rolling the land with very heavy rollers, immediately after it is ſown, and again about the month of April, if the plants ſeem root-fallen or hoven; and laſtly, by ſheltering the crop from drying winds.

I am well convinced, that if farmers who are ſubject to have their wheat lodge, will attend to the rules I have laid down, and put them in execution, they may not only guard againſt this misfortune, but alſo againſt the ſmut, by which ſo many fine crops are ſpoiled.

ARTICLE IV.

Obſervations on the Harveſting of Corn, with the methods practiſed about GENEVA, *and the lower* DAUPHINE, *by* M. LE MARQUIS DE COSTA.

I INTEND not to preſent any new ſyſtem to the readers; theſe, though ever ſo well formed, generally meet with invincible obſtacles, when they come to be carried into execution. What I would recommend is a method of harveſting grain practiſed in France, Italy, and in many parts of England. In order to ſet the advantages of it in the moſt favourable light, I ſhall firſt juſt mention the manner in which the corn is harveſted in the neighbourhood of Geneva, and ſhall then make ſome remarks on the defects of it; being ſenſible that the ſame defects, though probably with ſome ſlight variations, ſubſiſt in many entire provinces of large extent.

When this is done, I ſhall alſo briefly deſcribe the manner in which the grain is harveſted in the lower Dauphiné, to which will ſucceed ſome few remarks on its obvious advantages.

When we conſider how much inclined mankind is in general to promote a particular intereſt, it is indeed aſtoniſhing to reflect how ſlowly agriculture has been improved, though conſtantly cheriſhed and protected by a mild government.

Were the cauſes of this ſlow progreſs explored and laid open to the public view, it might be of great ſervice in teaching poſterity to avoid thoſe rocks, we and our anceſtors have ſplit upon.

Among other cauſes, I may venture to mention thoſe which follow.

Firſt, the difficulties attending good tillage, and harveſting the crops, the loſſes occaſioned by the ſlowneſs, with which the ſeveral works of huſbandry are performed, and the awkward manner of them; expences of repairs and improvements, which the land-owner, who is ſaddled with a heavy tax, cannot think of without trembling.

It is alſo certain that an attachment to ancient cuſtoms, and the bad impreſſion farmers have taken of the new methods, contribute greatly to this ſtate of languor.

In the preſent treatiſe, however, I mean only to mention thoſe difficulties, which ariſe from the manner in which the corn is in many places harveſted, and the very unneceſſary expences attending it.

This then is the method of harveſting the corn in the neighbourhood of Geneva.

They reap their wheat; as ſoon as it is dry, they make it up into ſheaves, ſo large, that a man can ſcarcely carry one of them; they carry them on carts to the barn, and toſs them one by one on the floor.

When the barn begins to be encumbered, the labourers either carry them up ladders, or draw them up with pullies, and lay them in ſome ſort of order: here they are left till winter, the ſeaſon for threſhing, for they threſh none before, except what they want for ſeed.

When ſeed time is over, and ſome other works on the farm, as wood cutting and carting, they begin to threſh.

The floor is made of planks, the ends of which are pinned to two oak beams; it is hollow beneath, and forms a kind of a drum, ſo that the flails rebound, and eaſe the threſhers. This floor laſts but a ſhort time, and coſts a great deal.

If the men are early riſers, they threſh two or three hours before break of day, by the light of a lamp; which, indeed, is unneceſſary, ſince they have uſurped a right of threſhing and dreſſing only five ſheaves a day. If they have finiſhed their taſk at noon, they reſt, and no maſter can exact from them the leaſt ſervice during the remainder of the day.

When they have threſhed their five ſheaves, they go with great ceremony about dreſſing them, uſing a wing, to bruſh off the cobs.

The corn is then carried to the granary, or elſe it is ſcrened, and they wait for a favorable market to ſell it to advantage.

This is the method of harveſting about Geneva; to which I ſhall add a few remarks.

They ſtill continue to reap, though many reaſons ſhould induce them to mow their wheat. I mow all my wheat.

According to my calculation I ſave, indeed, only half the expence of labour, but then there are many other benefits attending this practice, and among them, it is not the leaſt, that a farmer can take all the advantages which a fine day offers him, by cutting and houſing a great deal of corn in it; thereby ſhortening the tedious time, which is now in many places allowed for harveſting.

My tenants will not, it is true, as yet, adopt this practice, being attached to a ſtupid cuſtom handed down to them by their forefathers, though they acknowledge it out of their power to aſſign one good and ſubſtantial reaſon againſt mowing of wheat.

The immoderate ſize of the ſheaves is one of the greateſt inconveniences attending the method of harveſting I have above deſcribed, as it occaſions a ſpoil of young wood, well worthy the ſerious attention of the government.

Theſe large ſheaves can only be bound with long wyths, cut from young plants; and they always prefer the ſtraighteſt oak or aſh for the purpoſe. They cut theſe wyths, and carry them off by cart loads; foundation enough, truly, for the many complaints which have been made by writers who have treated on the ſubject; for the waſte and ſpoil reſulting from this pernicious cuſtom, are more than would eaſily be imagined.

When they make theſe large ſheaves, they lay one gavel with the ears to the right, and another with the ears to the left, ſo that the ears are expoſed equally at each end of the ſheaf, and when the men are loading, the rubs and jerks which the ſheaf muſt neceſſarily have on account of its ſize, being ſo diſproportioned to the ſtrength of the workman, occaſions a great deal of the corn to ſhale; and even when it is raiſed towards the man who is loading, he has no other method of getting it into the carriage, but by dragging it up, and afterwards hauling it to the place where it is to lay; this occaſions a farther loſs.

Thus if we only ſurvey the ſpot where the carriage was loaded, we might naturally conclude it had been newly ſown very thick, for the corn is ſcattered about in ſuch a manner, that it may be taken up by handfulls.

The ſame may be ſaid when the load comes to the barn, in toſſing down the ſheaves, and laying them in order, a vaſt quantity of corn is ſhaled, and the barn yard is ſo plentifully ſtocked with it, that you will ſee the very ducks and pigs refuſe to eat it, ſo that it is cruſhed by the feet and wheels, or loſt and thrown upon the dunghill; the jolts of the carriages alſo, which are at beſt but indifferent, and the rubbing of the hedges contribute not a little to a farther loſs.

Leaving the corn three, four, or five, months before it is threſhed, occaſions a quantity, which cannot poſſibly be eſtimated, to be conſumed by the rats.

I have often ſeen ſheaves thrown on the floor quite hacked to pieces by thoſe animals, which never touch the ſtraw till they have eat the corn; there is not a threſher but what ſees this every day of his life.

The ſmalleſt hole in the roof of the barn, or in the gutters, will preſently ſpoil twenty or thirty of theſe large ſheaves; and they often lay in parts of the barn, where the loſs will not be known, till the ſheaves are taken down to be threſhed.

If the weevils alſo get into the barn, which is no uncommon thing, the corn will ſtand a chance of being half conſumed before it is threſhed.

God defend us from ſuch early riſing ſervants as thoſe I have mentioned; we every day hear of their ſetting barns on fire by their careleſſneſs; houſes, ſtables, cattle, ſtock, houſhold-goods, all are conſumed in the dreadful conflagration, and it will take a number of years for a farmer to repair his part of ſuch a heavy loſs.

We may, amongſt the reſt of the inconveniences of this practice, mention the hardſhip of the neighbours who have no occaſion to riſe ſo ſoon; theſe, if they live near a barn, are kept awake great part of the night by the ſtrokes of the flails.

This cuſtom which the farmers ſervants have uſurped of threſhing only five ſheaves a day, occaſions the maſters to have their ſheaves made the larger, that their men may earn them the more, ſo that in threſhing five, they threſh as much corn as if they threſhed ſeven or eight of a more moderate ſize; hence all the diſadvantages reſulting from large ſheaves.

Theſe then are the inconveniences attending the method of harveſting above deſcribed, and they are doubleſs the ſame in many other places; or if ſome of them are avoided, they fall probably into other errors of a more dangerous tendency.

I muſt however ſay a word or two on the ſubject of the buildings required on a farm, the repair of which often ſwallows a great part of the rent.

A farmer who is willing to adopt new methods of huſbandry by which his crops may be doubled, is terrified at the apprehenſion of the expence of building an additional barn; for he cannot expect his landlord will do it, and this difficulty makes him conclude to follow ſtill his old cuſtoms, as to adopt methods lately recommended might bring on expences he could not bear tho' they might at the ſame time increaſe his crops.

Farm houſes, barns, &c. ſhould be built at a moderate expence ſo as to make them uſeful; an elegant ſtructure is entirely beſide the purpoſe, it ſwallows up all the profits of farmers, and diſcourages proprietors from occupying their own land. But the buildings ſhould not on the contrary be too mean, or ſuffered to go out of repair; this occaſions great diſcomfort and loſs of corn; it is a ſaving no ways to be commended.

In the lower Dauphiné, their method of harveſting, is as follows.

They reap their corn becauſe they are as yet unacquainted with the advantages of mowing it.

As ſoon as the corn, having had field room, is dry enough to carry, they bind it into ſmall ſheaves, ſo that about ten will yield a buſhel of corn; the bands are made of a little ſtraw taken from the ſheaf, and the ears are laid all one way; they load them on a cart, with a coarſe cloth laid at the bottom of it. They handle the ſheaves however with ſo much caution, that very little of the corn ſhales, the rubbing is all againſt the foot of the ſheaf, and the jolts of the cart againſt the hedges do no manner of damage.

When they come to the floor, which is in the open air, they unload the ſheaves with the ſame fork that loaded them, and then proceed to ſtack them round a pole, about twenty-five or thirty feet high, the ears being all laid inwards, and the loweſt ſheaves reſting on ſome faggots, to keep them from being injured by moiſture.

They then continue to pile them up, widening as they come towards the middle, and afterwards narrowing the ſtack, till it is brought to a point; the whole, in ſome meaſure, reſembling the figure of a cone; the outſides are well raked, and the top is capped with ſome good rye ſtraw, tied faſt to the pole.

In this way, the corn is not only ſecured from the depredations of the rats, which cannot enter it, but from damage by the weather.

They continue then as long as the harveſt laſts, making other ſtacks round the floor, and as ſoon as all is carried and ſecured, they begin to threſh.

The floor is made of clay and cow dung mixed, which, having firſt levelled the ground, they lay on in a thin coat.

The manner of threſhing varies much, even in the ſame neighbourhood.

About St. Marcellin they threſh with Box-tree rods, tied together with ozier twigs, two of the rods being on one ſide, and one on the other; ſo that one ſerves for a handle, and they threſh the corn with the other two. In this way the ſtraw is much broken, and the cattle like it the better for it; women and children all lend their hands.

About Gap, they ſeperate their corn by horſes, which they teach to trot lightly over it.

Near Valence they uſe the flail.

In Piedmont they make horſes trot over the corn, drawing after them a large wooden roller, cut in angles like a ſtar, and the angles falling on the corn the whole length of the roller, ſeperate the corn from the ſtraw.

All theſe methods are very expeditious, inſomuch that in a fortnight at moſt, the largeſt farm will have the whole quantities of corn threſhed, and ready for market.

With reſpect to dreſſing the corn, it is impoſſible any method can be more ſimple and eaſy than that which is always practiſed, where the corn is threſhed abroad in the open air.

Every day at ſun ſetting, when there is a little wind ſtirring, for it is very ſeldom a perfect calm, one or two men, or more, take the corn with the chaff as it came from the flail, and caſt it by ſhovels full, a-thwart the wind, four or five paces from them; this is done with an eaſy ſtroke; all the ſhort ſtraw, chaff, and cobs, are carried on one ſide by the wind, the corn and the ſtones that may be mixed with it, fly forward, only the ſtones being heavier go fartheſt, the corn falling ſhort in a heap by itſelf.

The farmers are aſſiſted in harveſt, by men who are called Taſkmen, theſe weed the corn, help reap, threſh, and dreſs it; and inſtead of being paid in money, they have two buſhels out of eleven.

When night comes the taſkmen firſt take their ſhare, then the farmer ſecures what belongs to him, and in about a fortnight all the corn is got into the granary, ſecure from the rats, which are deſtroyed by traps, poiſon, and cats; and their holes are carefully ſtopped up.

The ſtraw is again ſtacked, and being properly raked at the top, very little of it is ſpoiled by the rain, and that ſerves for litter. The farmers alſo ſtack their hay.

I ſhall now add a few remarks on this method of getting in the corn.

It muſt be acknowledged, that a great deal of corn is loſt by their manner of harveſting about Geneva, which would be ſaved, if they adopted this method, ſo much to be prefered.

Small ſheaves have a ſingular advantage, which is, that if they happen to be wetted by a ſhower of rain, by ſetting them an end, they receive the benefit of the air, and one hour's ſun will dry them, ſo as to hinder the corn from ſprouting.

The ſaving of the bands is alſo an object worth attending to. But theſe advantages are but trifling, when compared to that of having all the corn ſafe in the granary in three weeks after harveſt, defended from the ravages of the rats, and ready for the market, ſhould an advantageous opportunity of ſelling it preſent itſelf.

If the threſhers are not honeſt, which is too often the caſe, they have not ſuch an opportunity of pilfering, in working only about a week, in the open air, in ſummer time when they are thinly clad, as they have in winter, in the barns.

They often threſh in the night, and in retired places; if therefore they only take one pocket full, every time they go home, for the ſpace of three, or four months, it will in the whole, be ſomething conſiderable.

But all theſe advantages put together, are little in compariſon, to what is ſaved in buildings about a farm, in the lower Dauphiné.

The buildings about the largeſt farm, are but trifling; the kitchen is generally the firſt room, as you go in, a chamber behind it, a ſtable large in proportion, to the number of horſes, and cattle, that are kept, and a loft to keep the hay, in that is cut from the ſtack, and ſome ſtraw which they mix with it, to give to their cattle in winter.

In caſe the farm ſhould be improved, it is pure gain, for all the addition neceſſary to be made, will be to the ſtable, and this cannot in reaſon, be grudged; beſides, in caſe of fire, the loſs is not ſo great, the corn is ſecure, to rebuild the houſe, will coſt no conſiderable ſum, and the corn being threſhed abroad, is not ſo liable to be ſet on fire.

I may add, that the winter ſeaſon, which is dedicated to threſhing, is more precious, than is generally imagined; at this time the ditches ſhould be ſcoured, and the fences made good, the manure ſhould be carried on the land, the wood ſhould be laid in for fuel, and the timber for repairs; and in fact every kind of work, that will conduce to the laſting benefit of the farm.

Of all the farmers to whom I have mentioned this method, which I am endeavouring to introduce, in the neighbourhood where I live, not one can form a reaſonable objection to it; only ſome ſay, that in the winter time, they give every night, the cobbs, to their cattle, and feed them in the day time, with the chaff, and broken ears, as they are thraſhed; this advantage they ſay would be loſt, and they add that in ſummer, their cattle work too hard, to do with ſuch fodder.

In anſwer to this, I muſt admit, that ſome of the chaff will be loſt, becauſe the cattle cannot eat it faſt enough, and if it is kept, the rats get into it, eat the beſt part, and ſpoil and taint the reſt. But could not a brick bin be contrived to keep the chaff ſafe from the rats? Yet even in caſe this could not be done, the loſs after all would not be great, ſince clover, or Saint foin hay might well, and reaſonably ſupply its place.

I allow alſo, that men are not ſo eaſily got in ſummer, and that their wages are larger. Yet if hands are ſcarce, as one man will do the work of two, leſs will be required; and if a man will threſh in the ſummer, as much as in the winter, though you double his wages, you ſave at leaſt, the keeping of one man.

Monſieur Lullin de Chateau-Vieux, told me, that he one year tried to have his corn threſhed abroad, and that one man with great eaſe, threſhed fifteen of the large ſheaves in a day, which is three times as much as is done in the winter.

To conclude, though many more objections might be made to this method of getting in corn, yet I am of opinion, that they will ſcarcely have any weight, when compared to what may be ſaid in its favour.

ARTICLE. V.

An eſſay on the Culture of Madder, including a newly diſcovered method, of uſing the Green-root in dying, by M. Dambourney.

THOUGH, after what has been written on the ſubject, by Meſſieurs Duhamel, and Hellot, it may appear like temerity in me, to treat of Madder, I ſhall nevertheleſs venter to lay before the public, ſome obſervations I have made, during the four years, in which I have cultivated this plant.

I am well perſuaded, that they did not eſcape the notice of thoſe great men, and if they have not mentioned them in their writings, it has been becauſe the purſuit of objects more new, ſeemed of greater importance; however like good natured farmers, who have reaped a large crop from their land, they wlll not be averſe to my picking up a few gleanings after them.

Mr. Rondeaux, a member of the academy, found about eight, or ten years ago, two plants of Madder, on the rocks of *Oiſſel*, and planted them in his botanical garden. He gave me afterwards ſeveral ſlips, which I planted merely out of curioſity; but a paper written on the ſubject by M. Duhamel, opened my eyes, and I plainly perceived the importance of this culture. I applied myſelf then ſtrenuouſly to it, and obſerving all the methods that were laid down with others which appeared to me analagous, I, in the ſpace of four years, obtained a ſufficient number of roots, to try the culture of this plant, in the open field.

In this interval of time, I was informed that M. Pierre Dupont cultivated with good ſucceſs at Elbeuf, ſome madder plants which he had procured from Liſle, in Flanders. He was requeſted to make me a preſent of one hundred ſlips. This little aſſiſtance, added to what I had before raiſed, obliged me to ſearch in my garden at Oiſſel, for a place to extend this culture; I found no ſpot vacant, except two walks, which I broke up to gratify the inclination which was now ſo predominant in me. I cauſed one of theſe walks to be plowed up, and the ſoil proved to be a yellow clay, with a mixture of ſand, under which, at a ſpade's depth, was a bed of lime ſtone gravel, which was not broke into.

I divided the walk lengthways, and without uſing any manure, in December 1757, I planted in one half of it, the ſlips I had received from Elbeuf, and afterwards, tho' without mixing them, I planted what ſlips I could get from my own beds.

The other half was ſown in April 1758 with ſome ſeed I had ſaved. I cropped in the ſame manner the reſt of my walks, as faſt as I could procure either plants or ſeed, being careful for the firſt year to keep the beds well weeded, and to lay down the branches as faſt as they made any ſhoots.

In the autumn of the year 1758, I got ſome ſeed from the native Oiſſel plants, as well from what were ſown, as from thoſe raiſed from ſlips, but the Madder from Elbeuf did not bloſſom, tho' it puſhed forth ſtalks above three feet in length; even in the year 1759 it yielded me ſeed only on a few branches, whilſt the Oiſſel madder gave a full crop. When the ſtalks were dry I had the curioſity to get ſome of the roots taken up, which furniſhed me with ſome intereſting pieces of knowledge.

I. Though it is laid down as a certain fact in the Encyclopedia, that the roots of ſown madder are five years before they attain the ſize, which thoſe proceeding from ſlips will get in a year and a half, yet I found no ſuch thing, for they ſeemed equal; and, if there was any difference, it was in favour of the ſown madder; both one and the other occupied almoſt entirely the looſe earth on the ſurface, and often puſhed their tap-roots even into the hard bed beneath; but in order to penetrate it, three or four of theſe roots would wind themſelves together, and in paſſing thro' the crevices of the rock, they aſſumed whatever form the ſpace would permit them; however when they had got thro' it, and reached a bed of fine pure ſand which lay underneath, they reaſſumed their natural ſhape and former good condition. In this ſand I was obliged to quit tracing them at the depth of four feet.

Experience then convinces us that we ſhould loſe no time, but begin immediately to ſow our madder; and we are alſo now ſatisfied, that this plant may be cultivated with ſucceſs in land of a very moderate quality, and that even without the aſſiſtance of dung.

II. I took the advantage of ſome fine days, and dried in the ſun, but ſeperately, the roots I had taken up; thoſe from the Elbeuf plants ſeem on all accounts to merit the preference. They were larger and of a fuller colour than the others; upon being ground they look finer, but they did not anſwer ſo well upon trial. I took two ſkains of cotton, and dyed them, one with each of the ſorts of madder in equal quantities; that which was dyed with the native Oiſſel madder had the moſt brilliant appearance, and bore without alteration to be boiled thirty minutes,

nutes, when the other would not bear boiling ten minutes.

I afterwards compared the effect of Oiſſel madder with that of the Lizary, or Hazala of Smyrna, and I found it had greatly the advantage, not only in the brilliancy, but in the ſolidity of the colour.

From this time, I began to give the preference to this valuable ſort of madder. In the year 1760, I ſowed what ſeed I had in the beds of my kitchen garden. I requeſted M. Rondeaux to aſſiſt me in ſearching for ſome more of the plants, among the rocks of Oiſſel and Orival, but he aſſured me he had ſeveral times ſearched for them there in vain; neither was he more ſucceſsful in a journey he made thither in Auguſt laſt, with M. Dangerville.

This made me incline to have recourſe to the ſuckers which riſe from the roots of the plants; but notwithſtanding all the trouble I took to effect it, I could ſcarcely ever get any that had fibrous roots to them. Though the greateſt part of what I planted, had from four to eight inches of yellow root, yet nine out of ten died.

On the contrary, the ſuckers from the Elbeuf madder have naturally a great many fibres and young roots to them, and they are ſure to take, if they are planted in a moiſt ſeaſon. Nature ſeems in this caſe to make the planter amends for the ſmall quantity of ſeed which the Elbeuf ſort bears, whereas the other yields it in great plenty.

That I might neglect no means of encreaſing the quantity of the Oiſſel madder, I determined to plant ſome cuttings of the roots; and for this purpoſe, about the 15th of June laſt, I dug up a ſmall piece, and out of the roots that were raiſed, I picked all the runners: theſe I cut into lengths, each having two knots or buds, and the ſame day I planted them in drills, where all thoſe which were brown and woody, put forth leaves and roots, but ſuch as were yellow and tender ſoon rotted.

This

The neceſſity I was under of planting cuttings, let me into a piece of knowledge which I could not acquire, either from M. Hellot's treatiſe, or from my correſpondents in Holland; namely, from what part of the root the fineſt colour was extracted.

After all my runners were thus planted, I had ſtill remaining the crowns with lateral and tap-roots to them, reſembling both in form and colour large earth worms.

After they had laid three days in the ſun they were dry, and the inner ſkin being ſhrunk, the outer ſkin, or bark, ſeemed to hang looſe, to get rid of which, I made uſe of a method invented by M. Paynel de Darnetal; that is to ſay, I put my roots into a large coarſe ſack, in which I ſhook them well. The rubbing of the roots againſt the ſack and againſt each other, almoſt entirely ſeperated the outer ſkin or bark, which I got quite rid of with the help of a fan. In this manner I procured ſome truly fine prepared madder, which in its effects as much excels the Lizary, as that does the beſt Dutch madder. I would not, however, adviſe the planter to adopt this method, unleſs he ſhould by chance meet with buyers curious enough to give a price in ſome ſort, proportioned to the waſte and trouble which attends this manner of preparing the root.

Thus by taking up all ſorts of madder in the ſpring of the year, we in reality obtain that advantage of getting ſuckers and cuttings, which M. du Hamel gave us ſome reaſons to hope; and beſides, if the weather is tollerably fine, the roots may be enough dried in the ſun for them to keep, and the expence attending kiln drying is avoided, as well as the damage which the root ſuſtains by the fire. The colour would be ſtill finer, if the roots were dried in the ſhade, under a large ſhed open on the ſides, and to accelerate their drying in this manner, I have with good ſucceſs laid them on a bed of half burnt bricks. A bed of dry aſhes ſix inches thick may alſo for this uſe be laid under the roots, but then the aſhes muſt be covered with a large cloth, on which the roots are to lay, or elſe when theſe laſt come to be turned, the aſhes will be mingled with them. A plaſter floor will alſo haſten the drying of the roots in this method, and I am, indeed, inclined to prefer it to a brick floor, on account of the ferruginous particles with which bricks abound.

The chief difference in the Oiſſel Madder conſiſts in the roots being ſmaller and of a leſs brilliant colour, having fewer fibres, and the buds or joints in them being at a greater diſtance than in the Elbeuf Madder; but by the attentive obſerver, other differences will eaſily be diſcovered.

I. In the ſpring of the ſecond year it begins to ſhew itſelf above ground ten or twelve days before the other ſorts; the ſtalks are ſlender, and fall to the ground by the time they are a foot in length; the pale green leaves are long, narrow, thin, and waved or undulated at the edges, ſomething like the leaves of laurel; the flowers are cluſtered, the ſeeds but few, and what ſeeds do take are ſupported by a pretty long pedicle or foot-ſtalk.

On the contrary the Elbeuf Madder, originally brought from Liſle, and of the ſame kind as that which the Flemiſh refugees carried with them into Holland, puts forth ſtrong ſtalks, with many joints, capable of ſupporting themſelves, though they are two or three feet high.

The deep green leaves are thick, broad towards their baſe, and terminate in a point ſomething like thoſe of the great myrtle; not being at all, or at leaſt very little, undulated.

The flower does not ſhow itſelf till the ſecond or third year, is very apt to fall off, but, when that accident does not happen, the ſeed preſents itſelf ſomewhat like that of privet, except that its pedicles are ſhort. This ſeed ripens very well; but it is leſs valued on account of the eaſe with which ſuckers are obtained that are well rooted and furniſhed with fibres in plenty.

In order to extend my culture, and even in hopes of enriching my plantation with a new kind of Madder, I ſent to Smyrna for ſome ſeeds of the Hazala, or Lizary; fortunately one of the veſſels, in which ſome was ſent to me, eſcaped the hands of the Engliſh, and on the 20th of Auguſt, 1760, I received three pounds. It appeared to me to be exactly the ſame as the Oiſſel Madder; and I ventured to ſow a ſmall proportion of it on the 27th of Auguſt on one of the beds in my garden, and without covering: it came up very well, and ſuffered nothing from the winter.

I tranſplanted it the February following, and it is now in the ſummer, 1761, in full flower, and exactly reſembles the Oiſſel Madder, except that its ſtalks are ſtill more ſlender.

As to its culture, I ſcrupulouſly conformed to the maxims laid down by Mr. du Hamel. I afterwards, however, ventured to differ from him in ſome points, by trying to accommodate it to the plain methods of country Farmers.

I, in the firſt place, proved what M. Paynel de Dernétal had ſaid to be true; namely, that the layers, the management of which is very expenſive, produce only long, trailing, woody roots, with ſcarcely any colour in them; are hollow for two years, and yield but very few of thoſe vermicular roots, which alone are valuable. For theſe reaſons, I allowed four times as many plants as I did at firſt on a given ſpace of ground; the land was well ſtocked, and the expence of managing the layers ſaved.

It is impoſſible to avoid the expence of three diggings, or deep hoeings, the firſt year, and one in the ſpring of the ſecond; but that I might fall more into the method of culture in uſe in this country, I ſcattered the plants in rows after the plough in the ſame manner as peas or kidney-beans are ſown, and the workmen, who was acccuſtomed to hoe and earth up theſe, managed the Madder in the ſame manner, and with no greater expence.

According to the beſt obſervations I have been able to make, the eaſterly winds in the ſpring, and the hot weather of the ſummer, are equally fatal to all the Oiſſel madder planted in thoſe ſeaſons; on the contrary, all that was planted in autumn ſucceeded.

In the month of October 1760, I took up all ſuch of my plants as were two years old, and they furniſhed me with ſuckers enough to plant a rood of land. Very few of them miſſed becauſe they were all brown and ligneous, an advantage we are deprived of in the ſpring, as, at that ſeaſon, the greateſt part of the running roots are yellow, and worth nothing to plant.

But becauſe in autumn the roots cannot be dried ſo as to keep without the help of fire, it will be proper at that ſeaſon only to take up as many as will furniſh the neceſſary quantity of ſuckers, and from June to September, may be taken up what are for ſale.

On the ſixteenth of February 1761, I ſowed the greateſt part of the ſeed of Lizary, I received from Smyrna, and the remainder, a fortnight afterwards in a bed in my garden.

M. du Hamel making very honourable mention of his memoir in the ſecond volume of his Elements of Agriculture, ſays (ſpeaking of the ſeed ſown in the kitchen garden) that the plants, will be, after the ſecond year, fit to tranſplant into the open field. This is probably an error of the preſs, for I always tranſplanted theſe young plants with ſucceſs, two months after they appeared above ground.

In May I took up enough to plant twenty perches of land in the open field, and it ſucceeded very well, but this tranſplanting retards the growth of the plants, for they will be nearly as forward, if they are ſown in the open field in May; and what I ventured to ſow there ſooner, did not ſucceed well. As the greateſt part of our farmers are, unfortunately too poor, to undertake the culture of any plant, which will not produce them profit under eighteen months, I am about to try every method I can think of to make Madder grow in the ſame furrow with kidney beans. I cannot as yet tell what ſucceſs this wili have, but if it ſhould be ſuch as I hope, all obſtacles will be removed, as the crop of beans will repay the expences of culture, and in the ſpring following there will be occaſion only for one hoeing, as the Madder will be fit to take up in the month of September.

I intend at a proper time to give an account of the reſult of my experience, and I only now mention this ſcheme, to invite all lovers of huſbandry to endeavour at finding out every method of propagating Madder.

Every one of theſe methods may be better adapted to one ſoil, than to another, but I muſt here obſerve, that hitherto, in the dry light lands, ſuch as thoſe about Oiſſel, the ſeed ſown in May, or the well rooted plant, have ſucceeded beſt with me in the ſpring, and the ſuckers in the autumn.

As it is frequently proper to make even our miſcarriages turn out to our benefit, it being out of my power to dry the roots I had taken up in October, without the help of fire, I cauſed them to be uſed green, and without drying.

In the firſt place I waſhed them clean, that no earthy particles might remain on them, and as I had experienced, agreeable to what M. du Hamel ſays on this ſubject, that Madder looſes ſeven eighths of its weight, when it is dried ſufficiently to be ground into powder, I thought it would not be amiſs, if I proportioned my quantity accordingly.

With this view, in a bath which would have required one pound of ground Madder, I infuſed eight pounds of the green root being firſt pounded in a mortar, and having dyed ſome cotton with it in the ordinary way, I found that the bath was ſtill full charged with colour, and that the cotton was ſo deeply dyed, that it required two boilings to bring it to the common ſhade or tint.

I continued to make the experiment with ſix, and four pounds of the green root, and with the laſt mentioned quantity, I obtained a colour like that which is got from one pound of the dried root in powder.

As this is the caſe, half the quantity of the root is ſaved by uſing it green; yet this, tho' well worth our attention, is not the only ſaving.

I. The expence of erecting ſtoves and ſheds to dry the roots in uncertain weather is entirely ſaved.

II. There is no danger of loſs enſuing from the roots being dried too quick or too ſlow, either of which is prejudicial to its colour.

III. The waſte occaſioned by cleaning the roots, when all thoſe of the ſize of the tag of a lace are loſt among the rubbiſh, is avoided.

IV. Laſtly, there is no danger to be apprehended of the roots fermenting, which the ground root conſtantly does, if it is not immediately made uſe of.

All theſe advantages, put together, may amount to a ſaving of five-eighths in point of quantity.

If the planter underſtands dying himſelf, he may begin to reap ſome advantage from his labour as ſoon as ever his roots are large enough for the purpoſe.

Thoſe who are Dyers by trade, will, for their own ſakes, ſoon adopt this practice when more

Madder comes to be planted; nay, this practice may, in all probability, occaſion the culture of this uſeful plant to be more attended to; becauſe, as the root may be taken up at any time, after it has been planted or ſown eighteen months, when the farmer brings a quantity of the green roots to market, he will be ſure of ſelling them in that ſtate, without being ſubject to that trouble of dying them, which, though it is not much, yet does it appear formidable on account of its novelty.

The Dyer may every day buy a quantity in proportion to his conſumption, or he may let the planter know when he will have occaſion for any, and for how much.

I have beſides experienced, that the roots may be preſerved for the ſpace of four months in a hole three feet deep, by placing a layer of roots and a layer of earth alternately.

I am not a little pleaſed with the reſult of this experiment, as it alſo tends to leſſening the expence of dying, by which we may, perhaps, ſoon be enabled to ſell our dyed goods at a lower price at foreign markets. Beſides, this is a new thought, as neither M. Hellot, nor M. du Hamel, have given the leaſt hint of it.

I have alſo experienced, that the Elbeuf Madder root is very good when uſed green, which is of no ſmall importance to know, when we conſider, how eaſily this ſort is encreaſed, as it bears tranſplanting better than any other.

The principle difficulty, which I have now to get over, is to find out ſome method by which the roots may be taken up at a ſmall expence, and which ſhall not leave thoſe behind which ſtrike downwards, as they yield the beſt colour; for I found it very expenſive when I had them carefully dug up. M. du Hamel recommends plowing them up, but, from what I have ſeen, this method will not anſwer, except where a clayey bottom prevents the vermicular roots from ſtriking downwards.

I have wrote to Holland to be informed of their method of proceeding in that country; but the Dutch are too good patriots, not to be very cloſe in every thing that regards this plant, which we have permitted them entirely to monopolize. All the anſwer they made me was, that they uſed the ſpade and fork: I muſt therefore reſt contented, and wait for what time and circumſtances may inform me, and I ſhall not fail communicating that method which ſucceeds beſt with me.

One objection may poſſibly be made againſt encouraging the culture of this plant in France, which is, that it may occaſion the farmers to neglect their wheat, and this laſt is eſſentially neceſſary; but as an anſwer to this, beſides our having ſuch quantities of waſte land, which may be applied to this uſe, I may, with M. de Hamel, obſerve, that, in the beſt lands of this country, the farmer may enjoy all the advantages of growing Madder, without growing leſs wheat than he did before. In fact, it need only occupy the land eighteen months, and, as ſoon as it is taken up, wheat may be ſown on a ſingle plowing, and there will be a good crop, without the aſſiſtance of any manure or dreſſing whatever. It is the cuſtom, in our corn lands, to have only one crop of wheat in three years; and the ſame might be had if Madder was planted.

I am informed that the Engliſh make ſome advantage of their lands in Madder the firſt year, by ſowing onions and pulſe, ſuch as do not ſtrike their roots deep, or caſt much ſhade; but it would be much more advantageous to cultivate Madder, in conjunction with kidney-beans, as if the rows were made regular, nothing need prevent the ground being ſtirred, which contributes ſo much to the progreſs of vegetation.

As ſoon as I have ſo great a plenty of ſeed and ſuckers as to be able to riſk the loſs of any in trying to leſſen the expences of this culture, I ſhall willingly make many experiments to that end. It would give me ſingular pleaſure to ſee ſome better obſervations on this culture from more able hands; but I ſhall, nevertheleſs, eſteem it a great happineſs, if theſe, which I now offer, ſhould excite any degree of emulation, and contribute to leſſen that tax, of near 2,000,000 of livres, which we yearly pay the Dutch for that commodity.

Madder is uſeful in almoſt every dye, and particularly in dying linens, in which vaſt quantities are conſumed. We can cultivate it at home better in quality, and afford to ſell it at a lower price. The rents of our lands are more reaſonable, we enjoy a more temperate climate, and we are not, like the Dutch, obliged to contend with the elements.

ARTICLE VI.

A farther account of the culture of Madder in large, written ſince the laſt article, together with ſome curſory remarks on the culture of Madder by Seed alone. By M. D'AMBOURNEY.

IT will be to very little purpoſe for the favourers of Agriculture, to amuſe themſelves by planting Madder in their kitchen gardens, or on ſome piece of ground near their houſes; our trade will not be at all benefited by it, till the farmers in general adopt the culture of this plant.

With this view I applied myſelf particularly to render this culture as ſimple as poſſible, and the ſucceſs of my experiments, during the courſe of this year 1762, convinces me, that there will ſoon remain no other obſtacles to it but ſuch as are not to be removed by induſtry and attention, as the white worms, extraordinary droughts, and other misfortunes, to which every crop is equally ſubject.

I confined myſelf, in my experiments, to the three ſorts which yield the moſt lively and laſting colour, namely, the native Madder of Oiſſel, that of Poitou, and the Lizary or Hazala of Smyrna. All the three ſorts produce ſeed from the firſt year, and in the ſecond year, above 2000 ſeeds may be gathered from a plant which would not yield above from 20 to 30 cuttings and ſuckers. The difference betwixt theſe methods of culture is ſtriking, and ſhould, in every country where the ſeed of Madder will ripen, and this it will do in almoſt all France, induce the cultivaters of this plant to prefer ſowing it to any other method.

A trench, two feet deep, five feet wide, and as long as you pleaſe, ſhould be dug under a wall which ſhelters it from the north. About the middle of February ſome freſh horſe dung ſhould be put into this trench: when this is well trodden down, and is within three inches of the ſurface of the earth, the trench is then to be filled with good mould, which is to be flatted down a little, and raked level. This ſort of bed is to be preferred, becauſe it requires no kind of ſkill to make it, whereas, to make a raiſed hot-bed, it is often neceſſary to employ a gardener. The expence of this bed is not to be mentioned, becauſe it may be ſown ſix times in the ſpace of a year, and after that the fine mould, it produces, will be worth at leaſt as much as the horſe-dung which was at firſt uſed.

This need not prevent ſeed being ſown in the kitchen garden; but as this laſt work ſhould not be done till the middle of March, for fear of the froſts, there is ſtill a great advantage from ſowing on a hot-bed, as a month gained at this ſeaſon cannot be too much valued.

On the 20th of February laſt I ſowed on a hot-bed, ſuch as I have deſcribed, about half a peck of Madder ſeed in little rills, about an inch deep, and three inches aſunder. This is a much better method than random ſowing, becauſe the ſeed is more compleatly covered, and the weeds are with greater eaſe deſtroyed.

In about nineteen or twenty days the young plants appeared, they were watered and weeded as often as occaſion required, and by the 30th of April they were in a condition proper to be tranſplanted into the open ground.

I attempted laſt year to ſow Madder at the ſame time, and in the ſame furrows, with kidney-beans; but as theſe laſt appear above ground in about a week, they required earthing up by the time the Madder began to peep through the ſurface, and this operation entirely choaked it.

This year I imagined it would be beſt, inſtead of ſowing the ſeed, to ſubſtitute the young plants from my hot-bed; therefore, in a moiſt ſeaſon (this circumſtance is abſolutely neceſſary) I cauſed a piece of ground to be taken in hand, containing about 30 perches, on which the manure and tillage uſually given for dwarf beans had been beſtowed.

In every furrow, wherein the beans were ſowed, I cauſed young Madder plants to be placed, by women and children, ſix or ſeven inches one from the other, the roots being placed at the bottom of the furrow, each ſupported by a handful of earth, and leaning againſt the ſide, the upper leaves were above the ſurface of the earth. The Ploughman waited a little at the end of the land till the furrow was ſtocked with plants, when he opened a ſecond, in which neither ſeed nor plants were put, and turned the earth into the firſt. A woman finiſhed this work with a rake, as well to cover the beans compleatly, as to cloſe the earth to the young plants.

The third furrow was then ſown, and planted in like manner, till the whole piece was finiſhed, and the young plants appeared in rows about fifteen inches aſunder.

This work which was executed according to the cuſtomary method of ſowing kidney beans (except that only two thirds of the uſual quantity of ſeed was allowed) was compleated in five hours, by one plowman, three women, and three children. The piece was planted with twelve thouſand Madder plants, which took root, and made ſhoots by the time the beans were come up. They were according to the uſual cuſtom, without any ſort of danger, twice hoed and afterwards earthed up. They were ſeen to thrive well together: when the beans were ripe, they were pulled up, and the Madder which now poſſeſſes the entire ground, covers it as compleatly, as if it had been ſown with any artificial graſs. Moſt of it yielded a ſmall quantity of ſeed.

The crop of beans notwithſtanding the dryneſs of the ſeaſon, will nearly pay the expences, and next year there will be the ſeed, and the roots of the Madder, in return for once hoeing and weeding it in the ſpring.

My hot bed was ſcarcely cleared, before I again ſowed it with Madder, which on account of the extraordinary drought, I was obliged to leave till the ſixth of Auguſt; this loſt me one ſowing. I then took the advantage of a rainy day, to tranſplant it. The ſame method was obſerved, excepting that the ſeaſon being too far advanced, no beans could be ſown with it. The length of the roots alſo occaſioned more trouble in fixing the plants in the furrow, or they would have been ſpoiled, as in opening the ſecond furrow, one of the horſes was obliged to take his path up the firſt. Notwithſtanding this trouble the ſame number of people laid down ſixteen thouſand plants in ſix hours; the piece is well furniſhed, and the plants will be ſtrong enough to ſtand the winter.

On the fifteenth of May being deceived by the appearance of a ſmall rain, I ventured to ſow half an acre of land in alternate furrows like beans, but with Madder ſeed alone. I uſed about three pottles of ſeed, the loſs of which, I much regretted, for the conſtant drowth ſo hardened the ſurface of the land, that the young plants could not penetrate through it, and all was ruined. A method which I ſhall preſently mention, will on future occaſions prevent this misfortune happening.

The ſixth of Auguſt, I was inclined to ſow my bed a third time, intending to let the young plants ſtand through the winter on it, and not plant them out till the latter end of the following month of February; but the nineteen or twenty days, which the ſeed takes to come up a little diſconcerted me. In this parching ſeaſon it was neceſſary to water the plants frequently, which not only was fatiguing to the Gardener, but alſo laid part of the ſeed bare, and prevented its coming up.

I thought to remedy this by ſowing ſome ſprouted ſeed. Accordingly I laid ſome mould the thickneſs of three lines in the bottom of a box, this I entirely covered with ſeed, and ſo in alternate layers, till the box was full, the laſt layer of courſe being mould. I kept this continually watered, though it was expoſed to the ſun, examining every day what progreſs the ſeed had made. The eighth day the ſhoot began to appear, and the day after it was nine lines long. I ſeized this opportunity of ſowing in the rills of my bed, the ſeed together with the earth, in which it had germinated. I raked it gently over, and two days afterwards the rows were to be diſtinguiſhed.

This method even ſaved me once weeding, for this was generally neceſſary, as ſoon as the ſeed, which was not thus managed, was come up.

The growth of the young plants was ſo rapid, that inſtead of letting them remain all the winter on the bed, as I had intended, I ventured to ſtock a rood of land with them on the fourteenth of September laſt. This laſt plantation is indeed in danger from the froſt, but the event will ſerve as a leſſon for my future conduct.

Eight days before this was done, I laid ſome more ſeed to ſprout, I ſowed my bed again with it, and it came up ſo well, that I mean to let it abide the winter there.

I am in hopes, with the aſſiſtance of this method of managing the ſeed, to raiſe, during the next ſummer, ſix ſeveral crops on my hot bed. I ſowed at the ſame time ſome of this ſprouted ſeed in a bed in my kitchen garden, and it came up in four days time.

I intend at the end of next April to venture to ſow ſome in this manner, on a piece with kidney-beans; and I preſume, that this ſeed already ſprouted, coming up four days before them will be in a condition to bear, without injury, the firſt hoeing which the beans require; in this caſe, the expence of culture will be much leſs, than when the young Madder plants are removed to the piece ſown with beans, and the hazard and delay of their taking root will be avoided.

If this experiment ſhould ſucceed, it will be a great inducement to the farmers to adopt the method, as there will be occaſion for only one plowman, a woman to ſow the kidney-beans, another to ſow the ſprouted Madder ſeed in the ſame furrow, and a third to cover the whole with a rake.

The ſaving of the ſeed is expenſive, when there is but little of it; becauſe for fear of loſing any, it is gathered almoſt grain by grain. I thought myſelf this year rich enough to make uſe of a more expeditious method.

I cauſed all ſuch heads as had only a few green ſeeds at the ends, to be cut with a reaping hook, and laid on cloths in the ſun. In two or three days the ſtalks and leaves were become ſo brittle, that a few ſtrokes with a rod reduced them to powder. This was got rid of by twice fanning the ſeed, and the ſame may be ſaid of the green ſeeds, which after they were dried became much lighter, than thoſe which were black, or violet-coloured, and had their horny ſubſtance within fully formed.

I hope next year to ſave my ſeed with ſtill leſs expence, by cauſing all the ſtalks and branches to be mowed at once, and to ſeperate the ſeed from them, in the manner above deſcribed. The time for gathering this ſeed, is generally during the whole month of September.

The ſeed being thus ſeperated from the ſtalks, ſhould be again expoſed to the ſun, till it becomes quite dry, and will rattle in handling; for, if the leaſt moiſture remains in the black pulp which covers it, a fermentation in the winter will be the conſequence, or at leaſt it would grow mouldy, and the germ would be deſtroyed.

The ſeed muſt then be put into thin ſacks, which ſhould be hung to the ceiling of a dry and airy room, as well to keep it from dampneſs, as the ravages of mice, which are very fond of it.

If wheat is to be ſown after the Madder, the roots muſt be taken up in the beginning of October of the ſecond year.

No better method of doing this work, is at yet known, than to dig a trench two or three feet deep, at one end of the piece, into which the labourers, with pronged forks, are to turn the earth and roots, which laſt women and children pick up as they riſe.

When this is done, the land is to be plowed for ſowing wheat without any dreſſing, and with the ſaving of a third, or at leaſt a fourth part of the ſeed.

The Madder roots, being taken up, might be chargeable to the planter, if the conſumer ſhould endeavour to take any advantage of their being ſoon ſubject to decay. At this ſeaſon of the year he would be under a neceſſity, either of drying them in a kiln, or ſelling them for any low price that might be offered him.

Theſe inconveniences appeared to me to be the greateſt obſtacles to adopting this culture more generally in France, ſince it was neceſſary, either to erect kilns, or leave the roots in the ground, till a purchaſer could be met with. On this account, I cauſed a hole three feet deep to be dug in my garden; in which, on October 6, 1761, I threw thirty Madder plants, and the hole being filled up, remained in this manner expoſed to the air and rain. I cauſed it to be opened the 30th day of March laſt, when I found all the roots in good condition.

The hole was then again filled up, and remained ſo, till the thirtieth of September, when even the vermicular roots, though broken and ſeparated from the plants, appeared to me to be as firm and healthy, as when they were firſt depoſited there; but being curious to know whether they had not undergone ſome alteration not diſcoverable by the eye, I dyed with them, at the ſame time with ſome other roots I had taken up for the purpoſe, and I found no difference in the bath, nor in the ſolidity, or brightneſs of the colour.

The planter then may preſerve, in caſes of neceſſity, his crop for a whole year, in a trench dug in his yard, or even in the edge of a field, obſerving only to lay an alternate bed of roots, and a little earth.

In this manner he may wait for a proper opportunity, of ſelling them, and the conſumer can no longer play the tyrant, by giving him what price he pleaſes, becauſe he is obliged to ſell.

The dyer, who is friend enough to himſelf, to adopt my method of dying with the green roots, may in like manner, preſerve them in a hole, in his cellar, whence he may take them as his occaſions require.

I think it proper to repeat in this place, that the method of uſing Madder roots green, may be reduced to the following heads. They muſt be waſhed a little to clear them of the earth which naturally cleaves to their outer coat, and for every pound of dried Madder, which would be uſed, there muſt be four of the green root. The roots are to be chopped moderately ſmall and afterwards bruiſed in ſtone or wooden mortars, (by no means in iron) till they are reduced to a ſort of pulp. This pulp muſt be put into the boiler when the water (to which no addition muſt afterwards be made) is ſomewhat more than lukewarm. It is then left till it is ſo hot, as ſcarcely to bear the hand in it. The ſtuff, or cotton, is then to be plunged in, and kept moving for three quarters of an hour, the bath being ſimmering all the time; laſtly it is made to boil for three quarters of an hour.

As the bath remains when the work is done, charged with a much finer colour than when Dutch ground Madder is uſed, I intend this winter to try ſome experiments in order to diſcover what uſe may be made of it, and I ſhall at a proper time give an account of the ſucceſs I meet with.

ARTICLE VII.

Extract of a Letter from M. MICHEL, *Secretary to the Society of Agriculture eſtabliſhed at Beauvais, to* M. D'AMBOURNEY, *dated December* 2, 1762.

"THE ſociety of Agriculture, eſtabliſhed at Beauvais, having by accident got the copy of a manuſcript eſſay on the culture of Madder, intended, without loſs of time, to publiſh it.

"We knew not then that we were indebted to you for a treaſure, which you ſo readily parted with, in diſcovering the method of uſing the roots of Madder green, and without drying.

"When we ſhewed your eſſay to our Dyers, they were with ſome difficulty brought to give credit to a thing ſo contrary to their daily experience.

"Out of mere complaiſance, on the 9th day of laſt month, they conſented to make a trial of dying two pieces of thin flannel with the roots of ſome Madder, newly taken up out of a Surgeon's garden on the town rampart. Meſſ. Guerin, who made the experiment, found, as you obſerved, that in uſing the green root there is a ſaving of five parts in eight.

"The two pieces, dyed with the Madder grown here, without compariſon, ſurpaſſed in livelineſs of colour other pieces which were dyed with Zealand Madder. Samples of the pieces dyed in this new manner have been ſent to the council of ſtate."

ARTICLE. VIII.

An Eſſay on the Culture of Weld or Dyer's Weed, now very little cultivated in England, written by M. D'AMBOURNEY.

THE Dyer's Weed, often called Weld, is of great uſe in giving a yellow colour to wool, ſilk, cotton, and flaxen yarn; for this reaſon it has the name of Luteola Herba, Salicis Folio. It is an annual; its roots do not ſtrike deep into the ground; it puts forth long narrow leaves, of a bright green colour, lying circularly round the ſtem on the ground. The ſtem riſes from the middle of the plant to the height of three or four feet, it is often branched, and is furniſhed with leaves like thoſe at bottom, only they grow ſhorter as they approach nearer to the ſpike of flowers at the top: each flower is compoſed of three ſmall irregular petals of a greeniſh yellow colour, Theſe flowers are followed by a fruit of the ſame colour, rounded, terminating in three points, and encloſing ſeveral ſmall roundiſh brown ſeeds.

All the parts of the plant, and particularly the ſeeds, are uſed in dying. Such Weld as is ſmall, and of a ruſſet colour, is held in the greateſt eſteem; that which is larger, and of a dull green, is not ſo much valued. This plant grows naturally in all parts of France, and particularly five or ſix leagues from Paris towards Pontoiſe.

The cultivated Weld is much ſuperior to that which grows wild. A great deal of it is ſown in the vale of Lery, and at Oiſſel, a village not far from Rouen, and a conſiderable quantity of it is exported to Holland, beſides what is conſumed in France.

I ſhall now deſcribe the manner in which it is cultivated at Oiſſel.

In the month of July, when the white kidney-beans are in bloſſom, after giving them the ſecond hoeing, they are earthed up, and taking the advantage of a damp day, they ſow the ſeed of the Weld, as regularly as poſſible, about half a peck on an acre. If the farmer is careful, he immediately draws between the rows of beans a ſpray faggot, to ſupply the place of a harrow, in covering the ſeed. By the time it is come up, the beans ripen and are gathered.

Towards Michaelmas the weld muſt be hoed and weeded, and in this ſtate may be left during the winter. In March following, when the hard froſts are paſſed, if the weeds come up, it muſt be again hoed.

Towards the end of June, the ſecond year, when the bloſſom is gone off, the ſeed formed, and the plant begins to turn yellow, it is pulled the day after a little rain has fallen. Four men will then pull ſomewhat more than a rood in a day; but, if on the contrary, the weather is dry, and the ground hard, they will ſcarcely do half ſo much.

The weld is carried off the land in large bundles, but as ſoon as it is got under cover, it muſt be unbound, and the plants muſt be ſet up againſt the walls, or againſt hedges, where the ſun has great power, and in the ſpace of two days they will be ſufficiently dry.

The next thing to be done is to make it up in tight bundles, of about thirteen pounds each; and this work ſhould be executed on a threſhing cloth, that none of the ſeed may be loſt: theſe bundles are ſtacked up, where they ſweat and ripen, generally loſing half a pound of their weight. The bundles about twenty years ago ſold for fifty ſous a piece, but now they will not fetch a fourth part of the money.

A rood of good land where the Weld thrives well, generally yields ſixty of theſe bundles, each weighing thirteen pounds; but the plant is apt to be too luxuriant, and branch too much: that which grows in light lands is moſt eſteemed, riſing with only a ſingle ſtem, but then the farmer has only from thirty-five to forty bundles on a rood.

As ſoon as the Weld is pulled, the ſheep are turned into the field to eat up the weeds; a plowing is then beſtowed on it, and about the end of October it is ſown, either with wheat or rye, without any manure being laid on it.

If the ſoil is light, and intended for ſpring corn, when it is plowed after pulling the Weld, turnips may be ſown, which will be off the land before there will be any occaſion to plow it for barley; in this caſe, it may not be amiſs to refreſh the land with a ſlight dreſſing of horn ſhavings, or ſome ſuch manure.

When Weld is ſown after peas, the land is plowed, and the ſeed in the proportion above-mentioned ſprinkled on it. It muſt be ſown like turnip ſeed, being taken up betwixt the thumb and middle finger, the fore finger ſerving to ſcatter the ſeed as it falls.

Three furrows only ſhould be ſown at a caſt; and when the whole piece has been ſown in this manner, the ſeedſman muſt go over it again, beginning at the other ſide, ſowing twice in a place. It muſt then be harrowed in, and hoed at Michaelmas and in March, as is above noted.

Weld ſown after peas does not impoveriſh the land, and in the month of October wheat may be ſown in the ſame manner, as after the kidney-beans.

This plant is not only uſeful for dying yellow, but it alſo makes the ſea green, pea green, pale green, and bright green, by paſſing the ſtuffs through the oil vat; it ſerves alſo as a ground for many other colours, and is even uſed in dying fine blacks.

Many other plants grow wild in Normandy, from which the dyers get a yellow, which though inferior to that of Weld, are no ways contemptible; amongſt others, common heath, which is of great uſe in woolens, that are to be afterwards dyed green. The fruit of the great Buckthorn, gathered green, and dried in the ſhade, may be uſed inſtead of the Graine d'Avignon, but like that, it muſt only be uſed for dying leather yellow, the colour not being fixed enough for ſtuffs.

M. Hellot a member of the academy of ſciences, recommends for culture, a plant called virga aurea canadenſis; from the flowers of which he ſays he has obtained a good yellow, in all its ſhades. I ſhall try this experiment,

The bark of the aſh ſtripped when the ſap firſt beging to riſe, alſo the barks of the peach tree, and pear-tree have all afforded M. Hellot a good yellow. It is much to be wiſhed we had as many reſources for other principal colours as for yellow, and a great acquiſition it would be to find any ſort of leaf that would yield a pure, and laſting green.

ARTICLE IX.

An Eſſay on the Culture of Saintfoin, with ſome curious obſervations and experiments reſpecting the nature and properties of Marle, by M. LE CHAMBRIER DE TRAVANET, Treaſurer-general of the principality of Neufchatel, and honorary Member of the Berne Society.

MANY objects are included in rural oeconomy, and the increaſe and improvement of our fodders is doubtleſs one of the moſt intereſting. Without plenty of fodder, we cannot have numerous and well conditioned cattle, our manure would fall ſhort, the corn lands would ſuffer, and trade would be hurt. The ſouthern countries, much more fertile than ours, depend greatly on their ſeveral ſorts of fodder: oats are ſown there very thick, in order to their being mown green; they have recourſe to lucern, vetches, &c.

In Switzerland they have made trials of clovers, lucern, and Saintfoin, and experience induces them to give the preference to the latter. In ſome places Saintfoin has proſpered ſo well, that the price of fodder was conſiderably lowered by it.

Theſe advantages have induced me to communicate to my countrymen ſeveral methods of cultivating this kind of fodder.

I muſt take the liberty, however, of making two previous remarks, though they may ſeem rather to make againſt the ſubject of this eſſay.

In the firſt place, it is now reckoned good oeconomy to cultivate the artificial graſſes. The French, the Engliſh, the learned in the north, all write on this ſubject; in a ſhort time there will be nothing but artificial paſtures, of this Saintfoin may ſerve for example in Switzerland.

This plant flatters the maſter's eye by yielding a large quantity of fodder. The farmer reckons on the number of cart loads of hay which his field produces him, yet, if two loads of the ſame dimenſions are weighed, one of good natural upland hay, and the other of Saintfoin hay, the firſt will be found to have greatly the advantage. If to this we add, that a part of the Saintfoin muſt be left for ſeed, the hay of which part is very harſh and wears out the teeth of the cattle, we ſhall doubtleſs find that two loads of good natural hay will go as far as three of Saintfoin.

It ſhould alſo be conſidered, that the firſt year's crop is almoſt entirely loſt; that the charges of laying down a field in Saintfoin, what with the ſeveral neceſſary plowings, the buying of the ſeed, and the marling the land, which is very expenſive, make it paſt a doubt, that to change a natural into an artificial paſture is not always ſo advantageous as at firſt it may appear to be.

With reſpect to lands in tillage, which are ſown with Saintfoin, in order to calculate the advantages reſulting from this practice, it will be neceſſary to deduct the produce of them in corn, and allow for the difference in the number of cattle kept for the plough.

The reſult then of this obſervation is, that where-ever graſs-lands can be watered or manured, and where-ever the ſoil is in heart enough to yield even a moderate crop of natural hay, no advantage will reſult from ſowing Saintfoin. Lay on ſuch lands a ſmall proportion of Marl, and they will ſoon be full of wild clover.

II. I muſt obſerve, that much good land is now laid down to Saintfoin, which is certainly wrong, as it tends to leſſen the quantity of wheat that is raiſed. If, from time to time, ſome Marl was to be ſpread on ſuch lands, provided the ſoil was not too ſtiff or wet, it would ſupply the place of dung, and fine crops of corn would enſue.

Good Saintfoin-ſeed may be known by the pod, which ſhould be of a deep brown colour, large, and armed on one ſide with ſmall prickles. Open ſome of theſe; if the ſeed is black and wrinkled, it is a ſign it has been heated in the mow; if it is white and wrinkled, it is a certain ſign it was not ſufficiently ripe when it was cut. The firſt of theſe will not come up at all, and the ſecond will ſometimes produce a plant; but it ſoon turns yellow, and dies. The ſeed, to be good, ſhould be ſpeckled and bright; and if it is beſides of a yellowiſh red colour, it is all that can be required.

Saintfoin-ſeed ſhould be very clean dreſſed before it is laid up in a granary, that it may be perfectly clear from all ſeeds of weeds. It ſhould be depoſited in a very dry place, and well ſecured from mice, which are very fond of it.

Some ſay there are two ſorts of Saintfoin, one with a pale-red flower, and the other with a flower of a deeper red colour. They ſay the firſt does not branch ſo much, nor laſt ſo long as the ſecond.

I rather imagine the firſt to be a Saintfoin degenerated, by being ſown in a bad ſoil. C. Bauchin, in his Pinax, and other Botaniſts whom I have conſulted, admit not of this diſtinction. They define it only Flore Purpureo (by its purple flower); at all events the laſt ſort is to be prefered.

Soils vary ſo much in their nature and qualities, that there is a gradation, or we may ſay there are almoſt imperceptable ſhades from the lighteſt to the cloſeſt, and to clays.

'Till ſome able naturaliſt ſhall enquire into this matter, as far at leaſt as it relates to rural oeconomy, we muſt be content to make only vague and general diſtinctions.

Light, deep, and dry ſoils agree well with Saintfoin. It ſucceeds alſo well on high grounds, provided they are marled.

The quantity of vigorous and long lived plants, produced by ſtrong lands, is an evidence of their fertility; and theſe we always find when the land is on a ſlope, ſo that the rain, and the water from the land-ſprings, may be carried ſpeedily off.

Theſe ſoils will bear good Saintfoin, but then the coheſion of their parts muſt be corrected, and the roots of all the perennial plants growing on them muſt be totally and effectually deſtroyed. This may be done by deep plowings and croſs plowings, frequently repeated, for ſeveral ſucceſſive years, keeping the land conſtantly in tillage, and manuring it properly.

Frequent plowing is abſolutely neceſſary, becauſe, if this is omitted, the rains form a cruſt on the land, which is impenetrable to the influences of the atmoſphere, the ſun, and even the ſmall rains. This cruſt is an enemy to the tranſpiration and internal fermentation, which are the efficient cauſes of the fertility of land. That ſeeming barrenneſs, which is attributed to ſome land, ſhould rather be aſcribed to the lazineſs or inability of the farmer, than to any deficiency in the ſoil. I am, however, in ſome doubt, whether it is proper to lay Marle on compact, clayey ſoils. It is true, ſome benefit will at firſt reſult from this practice by the crops being encreaſed; but when the ſalts are exhauſted, and there remains only the caput mortuum, this will occaſion that ſoil to be ſtill more compact, which was before too much ſo. In this ſenſe, we are to underſtand thoſe who ſay, that Marle enriches the father, but impoveriſhes the ſon.

Nevertheleſs, if we could find a ſandy Marle, it might be of ſervice to clayey ſoils, becauſe, being diſſolved, and even its virtues exhauſted, the ſand would ſtill remain, and ſerve to make the land lighter and more tractable.

Obſerve, that Marles are ſeldom without ſome extraneous mixture; ſome are mixed with ſand, others with clay, and ſeldom any diſtinction is made between them. However, they may be eaſily known by waſhing them in water.

Saintfoin does not ſucceed in all places alike; wet ſoils by no means agree with it, unleſs they can be perfectly well drained. Its root naturally ſtrikes deep into the land, and for this reaſon it makes but ſlight returns, and laſts but a ſhort time on ſhallow ſoils. If the ſnow lays long on land, particularly if it has not a conſiderable ſlope, it by no means is ſuitable to Saintfoin, and ſtill leſs for planting an orchard.

Moſt farmers ſow their Saintfoin with corn, under a notion that the weeds will be thereby choaked, and the young plants ſhaded. If this practice muſt ſtill be followed, it ſhould be ſown with either wheat or oats, and by no means with barley, rye, any kind of pulſe, or with any ſeed, in fact, which produces a plant with ſtrong or numerous roots.

Others ſow wheat in autumn, and ſcatter Saintfoin-ſeed over it in the ſpring of the year.

I am apprehenſive, that they who ſow wheat or oats with Saintfoin, lay too much ſtreſs on having a crop the firſt year, and by that means one more than they would otherwiſe have.

I am of opinion that Saintfoin ſhould be ſown in autumn by itſelf. Shade may, it is true, be neceſſary to it in the ſouthern climates; but we have ſeldom in our country any weather ſo hot as to raiſe apprehenſions in us on this head. When the Saintfoin-ſeed has no partners to rob it of its food, it will doubtleſs unfold itſelf, and puſh forth its ſhoot with vigour; notwithſtanding all the care that can be taken there will ſtill be too many ſeeds of annual weeds, which either the wind or the dung will have brought upon the land, or which may have been preſerved in the ground ſince the preceding year. This root being more at liberty in land that has been well tilled, and moreover enriched by the influences of the atmoſphere and ſun, the rains, dews, and the internal fermentation, will preſerve a ſufficient coolneſs and moiſture, and will ſupply this plant with a greater quantity of nouriſhment, and make it more ſtrong and vigorous.

According to the celebrated Du Hamel, the root is only ſtrong and vigorous in proportion to the ſize of the plant.

The reſpiration and perſpiration of the ſtem, the motion of the ſap, the dilatation of the pores, being the effects of plentiful nouriſhment, are at the ſame time the cauſes of the plants living and increaſing in ſize. In this manner, from the moment of the ſeed's unfolding itſelf, the plant acquires a vigour, which enables it to overcome all obſtacles, as well thoſe of the ſoil as of unfavourable ſeaſons, which ſometimes happen; this ſame vigour alſo enables the Saintfoin the following year, to choak all the weeds which may grow near it.

If it is in any ſort convenient, it is much better to ſow Saintfoin in the beginning of autumn, than in the ſpring. Having taken root in this ſeaſon, it gets amazingly forward, when the fine weather comes on.

The beſt preparation of the land conſiſts in frequently plowing it three, and even four plowings, if it is poſſible, ſhould be beſtowed; and, if it can be done, the land ſhould be croſs-plowed. When land lays on the ſlope, the ſecond plowing ſhould be diagonal, becauſe the plough cannot meet the hill to croſs the furrows.

Before the laſt plowing, as much manure ſhould be laid on the land as is allowed for a crop of wheat, and the dung ſhould be very rotten; in this all good farmers agree.

The laſt time the plough is put into the land, it ſhould be followed by ſome children, who ſhould pick up all the weeds and roots they can ſee.

The ſeed being ſpread, it ſhould be covered two inches thick with earth; and to effect this, it will be neceſſary to paſs over the land a large harrow with iron teeth, and if it is loaded, ſo much the better. To this harrow ſhould be faſtened a buſh faggot, which lays the land ſmooth, and covers the ſeed.

The farmer muſt not think all this trouble too much, ſince as much is required, when either hemp or flax is ſown. As Saintfoin will laſt long on the land, it is as valuable a crop.

In Languedoc, though their land is better than ours, and their climate more favourable, yet are they moſt ſcrupulouſly careful when they lay down a field in lucern.

In order to prevent my repeating the ſame thing twice over, I ſhould in this place take notice of another method which has been communicated to me by M. Jeanneret the elder, who on all accounts is very capable of making trials of this ſort. The eſſay he was ſo kind as to write for me, contains many new and intereſting experiments. As it chiefly treats of a new method of uſing Marle, I ſhall add it, by way of ſuppliment, to this eſſay. This Gentleman being ſo good a judge in matters of Agriculture, will induce the reader to entertain a favourable opinion of it.

It is generally the cuſtom to ſow three times as much Saintfoin ſeed as would be ſown of wheat on the ſame extent of land; this proportion is too large and too uncertain. I am of opinion, that the quality of the ſoil, and number of plowings that have been given, ſhould regulate his matter. If the ſoil is good and well tilled, much leſs ſeed will do. If the farmer intends carefully to cover this ſeed, leſs will ſerve than when it is left on the ſurface of the land, for in this laſt caſe the birds and the mice come in for their ſhares. However, after all, it is better to ſow too much than too little, for when it comes up very thick, it is more likely to choak the weeds.

When Saintfoin is intended to be made into hay, it ſhould be mown as ſoon as it is in flower; for if it is left till the ſeeds come towards ripening, the ſtalks grow hard, and the root is hurt. Beſides, by moving ſomewhat ſooner, the ſecond crop will be the larger.

No cattle ſhould be turned upon Saintfoin, particularly whilſt it is young; for in feeding they are apt to draw up the young plant, roots and all. Beſides Saintfoin naturally makes a ſtrait ſhoot, and treading does it great injury.

An intelligent farmer has remarked that if Saintfoin is ſuffered to bear ſeed for ſeveral ſucceſſive years, its root becomes woody; but that if on the other hand it is conſtantly mown the root inſtead of puſhing deep into the land, grows large, and not drawing nouriſhment from any depth, the crop falls off.

To avoid theſe two extremes he every year mows for hay, two thirds of his Saintfoin, leaving the other third to ripen its ſeed, and taking care every year to vary that part which is to bear ſeed. His crops are large which evidently prove his remarks to be juſt.

In order to make the moſt of the ſtalks, which are hard, as having borne ſeed, they may be chopped in a cutting box, in the ſame manner as ſtraw ſs cut for horſes, or at leaſt they may be bruiſed with a flail.

Several methods of ſeparating the ſeed of Saintfoin, are in uſe, but it will be proper to particularize them, that every one may adopt that which he moſt approves of.

I. The Saintfoin being yet ſtanding, and the ſeed ripe, women are ſent into the field, who pull off the heads, and put them into their aprons; they are then carried to the barn floor, where they are either threſhed with rods, or rubbed hard betwixt the hands to ſeparate the ſeed. This method is attended with ſeveral inconveniences; it requires much more labour and expence, the Saintfoin ſtalks are trod down, and are afterwards with difficulty mown. Laſtly the ſeed gathered in this manner, is more apt to heat, and does not keep good ſo long as that which is left in the capſules, wherein it perfects itſelf, and acquires a greater degree of maturity.

II. Others mow the Saintfoin, after the manner of barley, or oats; that is, they fix a cradle on the ſcythe, that it may lay the ſtalks regular: when it is dry, it is laid up like common hay, and after it has ſweated or been heated in the mow the ſeed is ſeparated from it.

I am well aware that ſome of the ſeed will ſhed in mowing, but this is not wholly loſt, for it will grow, and by that means, in ſome ſort repleniſh the Saintfoin lay. Beſides this inconvenience is fully compenſated, as the ſeed acquires a ſuperior quality, by remaining in the capſule, which is ſtill attached to the ſtalk; by being heated in the mow, it is ſtill nouriſhed by the ſap remaining in the ſtalk, acquires a greater degree of maturity, and is afterwards more eaſily ſeparated.

To ſeparate the ſeed, ſome uſe large rods, which do the work very well, but if a farmer has a conſiderable quantity of Saintfoin, he makes uſe of the common flails, obſerving only to lay the beds very thick on the barn floor, that the ſtrokes of the flails may not bruiſe the pods which incloſe the ſeed.

This method is leaſt expenſive, and produces more ſeed, becauſe that which was not full ripe when it was mown, will perfect its maturity in the barn.

III. Other farmers ſpread one or two large threſhing cloths on the field, when the Saintfoin having been mowed and ſeparated into gavels like wheat, the workmen take theſe gavels one by one, and ſhake them over the cloth, or ſtrike them againſt a fork laid over the cloth; the ripeſt ſeed falls out, which being put up into ſacks duſt and all, they are carried to ſome dry airy place; where it is ſpread without ſeparating the duſt from it, and when it is ſufficiently dry, it is put into a dry room, and kept there till it is wanted.

When the crops of Saintfoin fall off, it will be proper to renew it. If it has not born ſeed for ſeveral years, it ſhould be permitted to ripen its ſeed; that which is firſt ripe will fall, and a conſiderable part of it will immediately ſprout and grow. Theſe young plants will ſupply the places of thoſe which are exhauſted. In this manner the common graſs fields renew themſelves.

As the ſalts of this Saintfoin lay muſt be exhauſted, it will be proper in autumn, to lay about fifty loads of marle on each acre; in the following ſpring, with the help of ſome iron-tined ſmall harrows, this marle may be ſpread with regularity on the field, and that which is not mouldered, but partakes of the nature of ſtone, muſt be carried off, and laid in a heap to mellow; after which it may be ſpread on the field.

By a load of marle is here underſtood, as much as a yoke of good oxen can draw, without being overloaded. If marle is not to be got, ſome very rotten dung, or mould may be ſpread on the field.

If it is an old Saintfoin lay, theſe will be but palliative remedies, and laſt only for a time, becauſe it is the general opinion that Saintfoin ſown in this manner is never either ſo thick, or laſts ſo long as the firſt ſowing.

In this laſt caſe it is beſt to turn up the field, and to deſtroy the old exhauſted Saintfoin plants, as well as the graſs and weeds, which now begin to get a-head. If the Saintfoin had been marled, the good effects of the marle will in ſome meaſure be renewed, as it will be again brought to the ſurface by the plough.

It will be proper to keep this field for ſome years under the plough, and till it in the manner already deſcribed. This will be no loſs, for the field may be ſown with corn or pulſe; the ſalts proper to afford them nouriſhment, not being diſſipated, the farmer will find every thing ſucceed to his wiſh.

When the field has been ſome years in tillage, it may be again ſown with Saintfoin, which will not fail to thrive. In this manner, by varying the crops on the ſame land, conſiderable advantages ariſe.

The happy effects of marle, for the purpoſes of vegetation, ſhould induce every one fond of philoſophical reſearches to enquire into its principles, and every farmer to diſtinguiſh that which he ought to prefer.

In order to ſatisfy the reaſonable curioſity of the firſt, and the prudent foreſight of the latter; I have thought proper to conclude this eſſay, with ſome enquiries into the nature and properties of Marle.

With this view, an able artiſt made under my inſpection ſeveral experiments, on ſome grey Marle approaching to the colour of ſlate, taken from two Marle-pits, near three leagues diſtant one from the other. They differ, in that one is fine grained, ſoft to the touch, and being expoſed to the air, ſoon diſſolves; the other is coarſer grained, feels rough in handling, is harder, and with more difficulty diſſolved, on being expoſed to the air, or being laid on land.

Three China baſons were taken, in each of which were put two ounces of Marle groſsly pulverized, becauſe it was taken from a large piece of Marle.

On that in the firſt baſon one hundred drops of ſpirit of nitre were firſt dropped, and when it began to ferment, cold water was poured on it. The ebullition was ſtrong, the baſon was filled with froth, and a great ſmoke iſſued from it. In the ſpace of a few minutes the Marle was perfectly diſſolved.

In the ſecond baſon the ſame operations were repeated with the ſpirit of vitriol, all in the ſame proportions, as in the firſt baſon. The fermentation was nearly the ſame; but inſtead of being diſſolved, the Marle was conſiderably increaſed in bulk.

Laſtly, in a third baſon, an ounce of diſtilled vinegar was poured; the ebullition on the cold water, being added, was the ſame; but the Marle inſtead of being diſſolved, became granulated like ſmall ſhot.

Two hours afterwards, ninety-five drops of ſpirit of nitre were again put into the firſt baſon, as much ſpirit of vitriol into the ſecond, and ſome diſtilled vinegar into the third; a new ebullition enſued, and the ſame effects were apparent, as from the firſt operation.

In three other baſons, exactly the ſame experiments were made, with the ſame quantities, and the effects were the ſame. We may thence conclude, that, though theſe two ſorts of Marle appeared different, to the eye, to the touch, and in uſing them, yet they may have the ſame effects in promoting vegetation; with this difference, however, that the effects of the hardeſt Marle is ſlower in proportion to the length of time it takes to diſſolve.

The four ounces of Marle, which had been impregnated with ſpirit of nitre, in the two baſons, were added together, a lixivium was made from them, which being evaporated by fire, yielded half an ounce of a nitrous ſalt, which crackled on the coals like nitre; and ſhot forth needles like it. This effect is no ways ſurprizing, ſpirit of nitre being only ſalt-petre, diſcharged of its earthly particles; ſo that when you add to it any earth whatever, provided it can be diſſolved in it, it becomes ſalt-petre again.

Some experiment was yet to be made on the ſubſtance of the Marle. A hard piece, juſt taken from the pit, was pounded, waſhed, and a lixivium made from it. The lotions being filtered and inſpiſſated yielded no kind of ſalt whatever.

The Marle being firſt diſſolved by the air, and then managed in the ſame manner, yielded a bitumenous ſalt, but in a ſmall quantity.

RESULT of the ſeveral preceding EXPERIMENTS.

I. IT was evident, that Marle will not amalgamate, or mix either with ſpirit of vitriol or diſtilled vinegar, which are both ſtrong acids; but on the contrary, they yielded a Magma, or a Coagulation. The Marle perfectly diſſolved with ſpirit of nitre; whence it may be concluded, that, though it may not contain in itſelf any ſalt, it will, nevertheleſs, imbibe and attract the univerſal ſpirit or nitre, ſo conducive to the fertilization of land.

II. That Marle which will ſooneſt and beſt diſſolve with ſpirit of nitre is to be prefered, as it will attract more powerfully the univerſal ſpirit, diſperſed in ever part of the atmoſphere.

III. Marle appears to be only a ſimple matrix, which like a ſpunge imbibes the nitre, and ſalts diſperſed in the air; ſince when it was firſt taken from the pit it yielded no ſalt; yet that which was taken from the ſame pit, and diſſolved in the air, yielded a ſmall quantity of a bitumenous ſalt.

IV. If Marle, even in the quality of a ſimple matrix, is well adapted to attract the nitre in the air, its effect on vegetation will be laſting, as it may be reiteratedly impregnated. This is made evident, by the earth from which the ſalt-petre makers have extracted the ſalt-petre. Being expoſed for a certain number of years to the air, and to the north eaſterly and north winds, and being ſheltered by walls from the ſouth, it imbibes ſalt-petre a-new, which is again by the former operations extracted.

V. From the preceding obſervations it ſhould ſeem we might conclude, that Marle would be of no uſe on light gravelly lands, when turned in by the plough; becauſe, not being expoſed to the open air, at cannot attract the nitre or univerſal ſpirit, and be impregnated with it. Experience, however, proves the good effects reſulting from this practice, which ſhould be attributed to the porous nature of the Marle; it imbibes the water which penetrates the ſurface of the ſoil, and preſerves it to refreſh the roots of the plants. Without this help, the fructifying water would either have ſunk deeper, or have been evaporated by the firſt heats.

VI. Marle has an effect ſo viſible, ſo ſpeedy, and even ſo laſting in promoting vegetation, that it is with ſome difficulty we can perſuade ourſelves it has no other quality but that of attracting to itſelf the univerſal ſpirit; may we not preſume that it contains ſalts or ſulphur, which art has not yet been able to diſcover. Nature ſeems to caſt a veil before our eyes, we ſee the effects, but the cauſes are hid from us.

Many of the conſtituent parts of minerals and metals eſcape our reſearches; they are exhaled and diſperſed by the fire of the laboratories, and, mixing ſalts and ſpirits with them, produces nearly the ſame effects, by means of fermentation; they are another ſpecies of fire.

Let us then be content to know what experience teaches us. Speculations on the nature of Marle are the leſs neceſſary, becauſe farmers ſeldom have it in their power to chooſe. Every one is obliged to make uſe of that which is neareſt to him; as, to bring this manure from any conſiderable diſtance, would greatly encreaſe the expence of marling the land, becauſe the price of carriage would be in proportion increaſed.

ARTICLE X.

An Eſſay on the beſt method of Marling and managing poor Lands; intended as a Supplement to the preceding Piece, and written by M. JEANNERET *the elder.*

IN all the various ſoils which I have hitherto endeavoured to improve at my eſtateatChatillon, my firſt deſire was to make myſelf acquainted with their nature, and for this purpoſe I always made trials to find out whether they were ſandy or a good mould, either black or light coloured, as by the reſult I regulated the quantity of Marle I was to lay on.

When I had made this trial, and found the ſoil to be light, ſandy, and hungry, I concluded that it required of courſe a larger quantity of Marle, which in ſuch a caſe I extended to 400 loads on an acre.

But before I lay on the Marle, I begin by breaking up the field I would improve in the month of May. To make this work the more eaſy, I turn up three furrows, the whole length of the piece, and immediately carry the earth to the other ſide of the land, where the work is to be finiſhed.

[The reader is deſired to obſerve, that in this work the ſhifting-ear-plough is uſed. This implement is deſcribed by M. du Hamel in his Elements of Agriculture, and does not materially differ from that deſcribed by Lewis in his hiſtory of Thanet, which laſt is now uſed in many parts of Kent.]

After this is carried over, the ear of the plough turns with eaſe the earth which is cut by the ſhare and coulter, and the turf is laid underneath. The ſame may be ſaid of all the ſubſequent furrows, provided the ploughman is attentive always to take the ſame breath of earth, which I fix at a foot.

By this means one furrow is always replaced by another, and the earth, that was carried to the other ſide of the land, ſupplies the vacancy which there would otherwiſe have been.

When this work is done, I leave the land in quiet for a whole twelvemonth; and that I may loſe no advantage, I cover it firſt with Marle, which, during the ſummer's heat, and the froſts of the winter, has full time to melt and diſſolve. Another advantage alſo reſults from this method, which is, that the turf being perfectly covered, as well by the Marle, as by the cart wheels going backwards and forwards over every part of the land, it amounts almoſt to a ſecond plowing, and the roots, of what kind ſoever they are, being broke and bruiſed by the cart wheels, inſenſibly die away.

In the following ſpring I again plow this land, and if it lies on the flat, inſtead of plowing it the ſame way I did at firſt, I croſs-plow it, beginning at one end and finiſhing at the other, obſerving not to make the furrows as wide as before, but at moſt eight inches. In this manner the land is completely tilled, and the ſurface is laid even, which it would not otherwiſe be.

If the land lays on a ſlope, as this methed cannot be put in practice, I content myſelf, after having again carried over the firſt furrow, with plowing it ſloping, ſo that the ſecond plowing ſhall not be in the ſame direction with the firſt.

When the land is thus twice plowed, I ſow the field with oats, peas, or tares; but never with barley, rye, or wheat; and immediately after harveſt, which uſually happens the latter end of July or Auguſt, I again turn up the field, and this makes the third plowing.

In the month of September, I lay on the ſame field about fifteen loads of dung per acre, and immediately afterwards, plowing for the fourth time, I ſow wheat alone, after having ſoaked the ſeed twelve hours in the juice of an old dunghill.

If the ſoil, which I have improved in this manner, is parching, ſandy, and dry, I uſe three buſhels of wheat; which, being ſoaked, ſwell and increaſe to four buſhels. If the ſoil is well broke, and has been ſome time in tillage, I uſe only ten pecks on an acre: and, laſtly, if it be a looſe, light, good, black mould, I only allow two buſhels.

The quantity of ſeed to be uſed, ſhould entirely be regulated by the good or bad quality of the ſoil; for in good ſoils the wheat will branch more than it will in ſuch as are indifferent; and, in theſe laſt, more than in thoſe which are parching and ſandy.

By obſerving theſe rules, it is very certain, that the farmer ſcarcely ever fails of ſucceeding, and makes the greateſt advantage poſſible of a very indifferent ſoil. I ſay, this he does with the aſſiſtance of Marle; and I muſt remark, that if the Marle is not well broke and mixed with the ſoil, the effects will be partial, and only viſible in ſpots. The reaſon for this is ſo palpable, that I need not mention it.

What is the intention of laying Marle on land that is light and wants ſubſtance? It is ſurely to give it a certain conſiſtance, render it capable of retaining the nitre of the atmoſpher, of preſerving a proper degree of moiſture, and to make it, from being barren, become fruitful. Therefore to attain this end, ſuch ſoils muſt be well broke, and the Marle mixed with them, or the farmer will be diſappointed in his expectations.

In order to make the moſt of land, managed in the manner above deſcribed, it ſhould be plowed immediately after the wheat harveſt, in the ſame manner as it was at firſt plowed; and in September wheat may be ſown a ſecond time, or in the following ſpring the bearded ſummer wheat may be ſown: this I did with good ſucceſs in 1760, notwithſtanding the drowth of the ſummer in that year.

If, on the contrary, the farmer chuſes to lay down his field with Santfoin, he may, in the month of March, ſow oats and Saintfoin, allowing only four buſhels of oats, and five of Saintfoin, on an acre. This quantity has always ſucceeded well with me, and, I have obſerved, that it is wrong to allow too much Saintfoin ſeed; becauſe, as that plant branches much, the ſtrong plants kill thoſe that are weaker, which laſt never live above a couple of years. I write this from my own conſtant experience.

I have practiſed another method of ſowing Saintfoin. When the wheat is five or ſix inches high, in the month March, I ſow Saintfoin over it. I have, at this time, at Châtillon, twelve acres ſown in the manner I have deſcribed, and it is as fine as ever was ſeen, yielding us laſt year above three loads per acre.

This then is the manner in which I treat the lands I mean to improve, regulating myſelf as to the quantity of the Marle, by the good or bad quality of the ſoil. The leaſt quantity that ſhould be laid on a good ſoil, is two hundred loads per acre, that is to ſay, if it is to be ſown, and the farmer would wiſh the effects to be laſting. If the farmer only deſires to to have fine Saintfoin, but which ſhall not laſt long, he need only plow his land in the ordinary way, ſow it with Saintfoin and oats in the ſpring; and at the end of three years, lay about eighty loads of Marle on an acre; and this is the ſmalleſt quantity that ſhould be uſed.

With reſpect to Saintfoin lays, as we have ſome which are eight, ten, and twelve years old, and which having for want of nouriſhment loſt their vigour, ſend forth only a ſmall ſtalks, my method of managing them is as follows. In the month of September, or in October, I cover them about an inch thick with Marle, which muſt be immediately ſpread, leſt the plants under the heaps ſhould be killed. In the ſpring following the Marle ſhould be raked, in order to lay it as equally as poſſible over the land; but, if the Marle ſhould happen to be ſufficiently mouldered and crumbled before the winter, it will be beſt then to rake it.

That I may not omit any thing material, and in order to convince the farmers how miſtaken they are in their preſent methods of managing Marle, I ſhall in this place make two obſervations.

In the firſt place, the ſooner Marle is laid on land, be it of what nature it may, the better it diſſolves and attracts to itſelf the nitrous particles in the air. Whenever I have it in my power, I make it my buſineſs to have the Marle carted on the land as faſt as it is thrown out of the pit, and I cauſe the lumps of it to be broke, and the whole immediately ſpread.

In the ſecond place, it has been ſaid, that Marle is prejudicial, when laid on in too large quantities, that it ruins the ſon, after having enriched the father. Nothing can be more contrary to reaſon and truth than this; for I can affirm, that thirty-three years ago, whilſt my father was living, I cauſed ſome land of the nature of that at Châtillon (light and dry) to be marled. After ſome years, the Marle being ſubſided, yielded no good effects. About ten years ago we plowed up this field, and of courſe brought to the ſurface the Marle, which was before, in a manner, loſt. It again attracted the nitre in the air, and was the means of producing as good crops as at firſt. This may be depended on as a certain fact.

In farther commendation of Marle; I muſt obſerve, that though the farmer may not have in view the ſowing of either wheat, oats, or Saintfoin; yet he may reap great adantage from it, by ſimply laying it on land, though of ever ſo indifferent a nature; becauſe it will infallibly produce clover, or rather it will revive this clover, which is generally a good bearing plant; and I can venture to aſſert, that this very year, clover came up as thick as poſſible, in a ſpot where a load of Marle was overturned, and where there was not before the leaſt appearance of it, but where, I preſume, there was either ſeed, or very minute plants.

I had like to have forgot one very eſſential obſervation with reſpect to Marle, which is that, when by length of time, by the effects of water, or the air, it is become white, and of the nature of clay; ſo far from being of ſervice to vegetation, it will ruin any ſoil it is laid on, by it's compact ſubſtance, and being totally deficient in ſulphur and ſalt, which conſtitute the chief merit of Marles.

The white Marles are generally found at opening the pits, and the bed is thicker or thinner according to the ſituation, the fall the water had at the univerſal deluge, and the action of the ſun, air, and water; but, be it as it may, they are to be rejected, and the lower beds of Marle preferred, particularly the ſlate-blue-coloured and marbled ſorts; provided they are ſoft, ſmooth, and have a ſoapy feel.

ARTICLE. XI.

An Account of the culture of the Virginian plane tree, for its uſe, and beauty, recommended by M. MILLER, being an extract of a letter from M. de WALDNER, a Lieutenant Colonel, in the French Service. Dated October 8th 1762.

THE Virginian Plane tree, grows very high, its ſhoots are ſtrong, and vigorous, its leaf which is very large, reſembles much that of the great maple tree. M. d'Aubenton ſays that the plane tree, is of a genus quite different from the maple, that the wood of it is in quality betwixt the oak, and the beech; and that it may be uſefully employed in building, making implements of huſbandry, and in the ſmaller handy craft trades.

[As M. de Waldner gives no particular deſcription of this tree, it may not be amiſs, to ſee what Mr. Miller ſays on the ſubject. The characters of the plane tree are, that it hath male, and female flowers growing ſeparate on the ſame tree. The male, and female flowers are collected in a round ball, they have no petals, and very ſmall empalements; they have oblong coloured ſtamina, which are terminated by four cornered ſummits. The female flowers have ſmall ſcaly empalements, and ſeveral ſmall concave petals, with ſeveral awl-ſhaped germen ſitting upon the ſtyles, crowned by recurved ſtigmas; theſe are collected in large balls. The germen afterwards turns to a roundiſh ſeed, ſitting upon the briſtly ſtyle, and ſurrounded with downy hairs.

The Platanus foliis lobatis Hort. Cliff, 447, Plane tree with lobated leaves, or the Platanus Occidentalis aut Virginienſis, Park. Theat. 1427.

Occidental or Virginian Plane-tree, grows naturally in moſt parts of North America to a large ſize, the ſtem being very ſtrait, and of equal girth moſt part of the length. The bark is ſmooth, and annually falls off. The branches extend wide on every ſide, the young ones have a browniſh bark, but the old ones grey; the footſtalks of the leaves are three inches long, the leaves are ſeven inches long and ten broad; they are cut into three lobes or angles, and have ſeveral acute indentures on their borders, with three longitudinal mid-ribs, and many ſtrong lateral veins. The leaves are of a light green on their upper ſide, and paler on their under. The flowers grow in round balls, but ſmaller than thoſe of the eaſtern Plane-tree. The leaves and flowers come out in June, and the ſeeds ripen in autumn.]

The plane-tree thrives well after being tranſplanted, and will grow in any ſoil that will agree with the lime-tree, requiring the ſame culture. M. du Hamel obſerves, that it thrives beſt in a moiſt ſoil, where it makes a moſt aſtoniſhing progreſs.

It ſhould be tranſplanted in autumn, about the beginning of November, in light ſoils, dry, and ſomewhat elevated; but in moiſt, clayey ſoils, this work may be deferred till ſpring. To prevent any damage which might enſue from a dry ſeaſon, it will be beſt to tranſplant this tree about the end of February; but the length of the winter and the climate ſhould regulate this matter. If the ſoil is low, ſtrong, and wet, this tree muſt of courſe be planted only in the ſpring.

I ſhall not enter into a detail about the manner of making the holes, and planting plane-trees in them, it is done in the uſual method; I ſhall only obſerve, that no bank of earth muſt be thrown up round theſe trees, under a pretence of ſaving them from being blown down by the wind, but they muſt be ſecured by ſtrait ſtrong poles, which ſhall reach to the top of each tree. It will be alſo proper to bind ſome twiſted ſtraw round the ſtem of the Plane-tree, in order to prevent it from drying, and the firſt year it ſhould be plentifully watered twice a week, when the weather is dry.

Above all things, care muſt be taken to weed the ground at the foot of the tree, to keep it clear of graſs, which is a great enemy to new plantations.

As the plane-tree is a quick grower, it will eaſily, on the ſlighteſt view, be perceived, that if the ſtraw bandages are not from time to time renewed, they will choak the tree.

When the trees are very young, being only two, three, or four feet in height, ſuch as thoſe I have now the honour to ſend you, they ſhould be put into a nurſery, and cut down to two eyes above the ground. In the month of June following, the weakeſt of the two branches are to be taken off, and the other is to be tied to a ſtrait ſtake. This precaution, however, was omitted in tranſplanting a part of the trees I now have, and they ſucceeded equally well.

The branches neareſt the ground were laid down, and they took well.

Some cuttings which were planted laſt ſpring, and which were only pieces of branches two inches long, ſucceeded tollerably well; for about a third part of them grew, which was more than could reaſonably be expected from ſuch young wood. It is true, that the ſoil of the nurſery where they are is very good, and that out of thirty plants, ſuch as I ſend you, not one died. Since the latter end of March, 1761, they have grown ſo faſt, that the ſhorteſt of them is near eight feet high, and the talleſt ten and eleven feet. They have beſides furniſhed thirty layers, which ſucceeded, and near twenty cuttings.

When your trees are ſix or ſeven feet high, you may tranſplant them to where they are to ſtand, if they are well rooted, without any trimming; but they muſt be ſupported by poles ten feet high. It ſometimes happens, that in plants of this ſize, the ſap will plentifully riſe only half, or two-thirds of the height of the ſtem. When this is the caſe, they muſt be let alone till the end of June; the ſtem muſt then be cut down to a little above the moſt vigorous ſhoot, and the other ſhoots muſt be ſhortened to half their length; the principal ſhoot muſt afterwards be tied to the pole, and in this manner the tree may be made to grow to almoſt any height, according as there may be occaſion.

No inſect ever attacks the leaves of the plane-tree; but I am apprehenſive that it is ſubject to be damaged by high winds, becauſe it has a very large leaf, and the vigorous ſhoots it makes muſt be tender and brittle for the firſt year or two.

Notwithſtanding this inconvenience, this tree muſt certainly be very proper to adorn publick walks, to plant by highway-ſides, and in particular quarters of the pleaſure-garden. It is preferable to moſt of our trees on account of the beauty of its ſtem and leaves, the quality of its wood, and particularly for the amazing quickneſs of its growth.

[Mr. Miller's account of the culture of the Virginian Plane-tree being curious, and not very long, the inſertion of it in this place cannot be improper.

He ſays, that it will grow extremely well from cuttings, if they are planted in the beginning of October, upon a moiſt ſoil, and, if they are watered in dry weather, will make prodigious progreſs, ſo that in a few years from the planting, they will afford noble trees for planting of avenues, and other ſhady walks, and their trunks are perfectly ſtrait, growing nearly of the ſame ſize, to a conſiderable height, there being the leaſt difference in the girt of this tree, for ſeveral yards upwards, of any other ſort of tree whatſoever.

The Hon. Paul Dudley, Eſq; in a letter to the Royal Society, mentions one of theſe trees, which he obſerved in New England, whoſe girt was nine yards, and held its bigneſs a great way up, which tree, when cut down, made twenty-two cords of wood. He alſo ſays, in the ſame letter, that he had propagated many of theſe trees, by cutting off ſticks of five or ſix feet long, and ſetting them a foot deep into the ground in the ſpring of the year, when the ſeaſon was wet, and that they always thrive beſt in a moiſt ſoil.

They are propagated very eaſily by layers, every twig of them will take root, if they are but covered with earth; theſe layers will be well rooted in one year, when they ſhould be cut off from the old trees or ſtools, and planted in a nurſery, where they may remain two or three years to get ſtrength, and then be tranſplanted where they are to remain; for the younger theſe trees are planted, the better they will thrive.

M. Miller made an experiment of this in 1731, when he planted one of theſe trees, whoſe ſtem was eight inches in girt; and near it, in the ſame ſoil and ſituation, he planted another, whoſe girt was not three inches; and the latter, at the time he publiſhed his Dictionary, was much larger than the former, and gained more in one year than the other did in three.]

ARTICLE XII.

An Eſſay on the advantages reſulting from the cultivation of a ſort of Wheat to be procured in Sileſia; written by M. Dumeſnil Coſté.

OF all the fruits of the earth Wheat is certainly of the moſt conſequence, I therefore think myſelf obliged to inform the public of a diſcovery I have made of a ſort of Wheat, the culture of which, it ſhould ſeem, is proper to be recommended and encouraged.

We know by experience, that Wheats, like fruits, differ one from the other.

The particular advantage of the ſort I would now recommend is, that it is not ſubject to the ſmut, and this I am convinced of, from the experience I have had of its culture.

This Wheat is leſs ſubject to lodge, the ſtraw being full of pith, it yields to the blaſts of wind, and riſes again elaſtic like a reed.

The Germans reap great advantage from this wheat: they chop the ſtraw, and feed their cattle with it in the winter.

The benefit to be derived from this wheat is ſtill more conſiderable, in that it yields larger returns than the common wheat; it contains more flour, and makes very good bread; though, I muſt confeſs, it eats a little dry and huſky.

This corn muſt be ſeperated from the ear by ſtriking handfuls of the ſheaves againſt the belly of an empty caſk, it being too tender to bear the ſtrokes of the flail, but as it parts eaſily from the ſtraw, a great deal may in this manner be ſeparated in a day.

The method of cultivating it is as eaſy as can be wiſhed; it muſt be ſown early, in a rich ſoil well prepared; and rather more ſeed ſhould be allowed than when common wheat is ſown.

FOREIGN ESSAYS, &c.

NUMBER II.

ARTICLE XIII.

An Eſſay on the Preſervation of Grain, containing a Method of keeping it, advantageous as well in reſpect to the Quality as Quantity. Written by M. Marcet de Mezieres, *of Switzerland.*

AS ſoon as the harveſt is got in, I give the corn in the barn as much air as poſſible, to haſten the drying of the ſheaves, which I find to be a matter of ſome importance.

About the middle of Auguſt I get my Wheat threſhed out. It coſts me indeed ſomething extraordinary; but I have ample amends made me, as it threſhes, dreſſes, and dries better; is no longer ſubject to the depredations of the rats and mice, to the thefts of ſervants and labourers, to receiving damage by damps or hard rains, or to ſhedding in the barn, great part of which ſheddings is generally loſt.

When the Farmer, with the view of ſaving a trifle, puts off the threſhing of his Wheat till the winter, moſt of theſe loſſes are felt.

After the firſt day, I cauſe all they have threſhed to be brought into a large room, the windows of which to the eaſt and ſouth are opened, and the floor being made very clean, is covered two inches thick with the corn.

As ſoon as it is dry enough, which may be known by its rattling when you pour it out of one hand into the other, I have it ſcreened, which ſeperates from it all the under corn, ſeeds of weeds, and duſt.

I have ready ſome ſacks, made very narrow, of coarſe cloth, which have been dipped in a ſtrong lixivium, ſeveral handfuls of green oziers having been put into the lye-letch, and into the copper chauldron where the lye was boiled. The reaſon of doing this will preſently appear.

The ſacks being well filled and faſt tied, hold about three buſhels (Engliſh) each. When all my ſacks are filled, two treſſels, about three feet high, with the backs rounded, and about eight inches wide, are ſet one beſide the other.

Upon theſe treſſels ſix ſacks are laid at ſix inches diſtance one from the other, on the intervals five more are laid, then four, three, two, and one; ſo that the whole number ſeems to form a perforated pyramid.

Other treſſels of the ſame kind are uſed for what ſacks remain to be piled.

When this work is completed, and the ſacks are all placed in proper order, I cauſe the ſhutters and caſements to be cloſed, and the double curtains of the windows to be drawn. The double doors are alſo ſhut, and I keep the keys in my bureau.

I never touch this ſtore, but for the uſe of the family, and for ſale; and it is very eaſy for me to diſtinguiſh which part is to be applied to theſe ſeveral uſes, as I always have the precaution to pile them on different treſſels.

Experience having convinced me that every body, whether liquid or ſolid, which contains in itſelf any principle of fermentation, is moſt inclined to have that principle ſet in motion, when it is long left in one ſituation without being moved, I never fail, towards the latter end of the month of March following, of having all the corn in my ſacks again ſcreened; obſerving when they are filled to make them the ſame weight they were before; when they are once more laid on the treſſels in the former order.

About the end of June, I think it enough to empty the ſacks one into another, and replace them.

When I want my room for the new corn, I cauſe that of the laſt harveſt to be carried to my town-houſe, where it is placed in the ſame order as it was in the country.

In the month of October, the corn, which was carried to town, is all ſcreened and ſifted in a wire ſeive, after which it is in order to go to the mill.

This corn is intended for the conſumption of the following year; ſo that the Wheat which I grew in 1761, ſerves me for the year 1763.

As I always ſend to town more than I have occaſion for to ſupply the wants of my family, particularly when it is good in quality and low in price, I have preſerved Wheat, in the manner above related, for five years and upwards, without there being any viſible difference betwixt the grain ſo kept, and that only one year old.

I have purpoſely made bread of both ſorts at the ſame time, and diligently comparing one with the other, there appeared not to be the leaſt advantage in point of goodneſs on either ſide.

It is true, that, apprehending the dryneſs of the corn might occaſion ſome inconvenience in the grinding, I cauſed the old Wheat to be waſhed in ſeveral waters, till the water came away pure and unſullied;

for the firſt water was dirty, and of a browniſh colour: the Wheat, being afterwards dried, grinds very well.

By this operation the bread becomes whiter and ſweeter; and I have experienced the ſame with regard to new Wheat.

I may then ſafely conclude, that in this manner corn may be preſerved much longer than the time I have mentioned above to have experienced, without ſuffering any ſenſible damage, particularly as all the danger to be apprehended muſt proceed from the inward moiſture of the grain; which moiſture muſt doubtleſs be inſenſibly diſſipated in the ſpace of five years.

If I miſtake not, the following inferences may be drawn from the facts above-mentioned.

I. That threſhing out Wheat as ſoon as poſſible after harveſt, preſerves it from the damage and waſte which muſt neceſſarily be the conſequences of keeping it too long unthreſhed in the barn.

II. That by putting it up in ſacks, when it is ſufficiently dried, we guard againſt a winter's fermentation.

III. That the treſſels keep it out of the way of rats and mice, and prevent its being damaged by any moiſture which might proceed from the floor.

IV. That the ſacks, being impregnated with the powerful bitterneſs of the ozier, keep it from being attacked by any kind of inſect, even flies, ſo much do they avoid this bitterneſs.

V. That the room being cloſe ſhut, prevents the alterations of the exterior air from having any ſudden effect; on which account theſe alterations are to be leſs apprehended, and indeed ſcarcely at all.

VI. That in caſe any ſudden tempeſts of wind and rain ſhould damage the room, and expoſe the corn to be wetted, it will be a very eaſy taſk to remove the ſacks, from the round ſurface of which the water will run off without ſoaking in; and if any ſhould by chance be wetted, it will be eaſy to diſcover where the damage is done.

VII. That every room which can be cloſe ſhut is fit for this purpoſe; as a ſhed built of timber frame-work, and lathed and plaiſtered within, will be as fit for this uſe as the moſt elegant granary built of free-ſtone. This is no ſmall advantage.

VIII. That, laſtly, this method is neither trouble-ſome, expenſive, nor requires much attendance; the ſeveral operations being very eaſy, and to be done at ſeveral diſtant times.

The owner has it in his power, at the ſlighteſt view, to know what quantity of corn he is poſſeſſed of; and as he keeps himſelf the keys of his ſtore-room, it is as ſafe as the money in his cheſt.

In my method, I guard, as much as poſſible, againſt the entrance of the air and light.

This way of preſerving Wheat, in ſome ſort, anſwers the end that is propoſed by kiln-drying it, which conſiſts of drying corn in order to promote its preſervation. All the difference is, that one operation is quick and forced, and the other requires more care and time.

The queſtion may be reduced to this ſingle point, which of the two methods, with the moſt certainty, preſerves the corn, without diminiſhing its natural ſubſtance, and with making the leaſt alteration, with reſpect to its nutritive and ſalubrious qualities.

I think myſelf obliged to acknowledge, that the kilns will moſt probable contribute to the longer preſervation of the grain; but then I cannot heſitate aſſerting, that the other method will promote moſt the preſervation of thoſe qualities in the corn which are ſo eſſential to the uſes for which it is intended.

Let us now, as oppoſed to the method I propoſe, make a few remarks on the preſervation of

Wheat in magazines or granaries, where it laid in heaps.

It cannot but be acknowledged, that it is in this manner much more expoſed to be injured by the alterations in the air; particularly in damp weather, the moiſture ſoon penetrates the floors, and the corn ſuffers accordingly.

It is beſides very rare to find any corn, after being twelve or fifteen months in the granary, but what is attacked by weevils and other pernicious inſects.

In caſe the roof ſhould not happen to be weather proof, the leaſt cracks are moſt dangerous.

Let a ſingle quart of water be, in ſummer time, poured into the middle of a large heap of Wheat, and it is incredible to think what damage will be done in a ſhort ſpace of time.

It is needleſs to enlarge on the infinite number of inconveniencies which are known to attend this method of preſerving grain, and by which ſuch heavy loſſes have been frequently ſuſtained.

It may perhaps be objected, that this method, tho' very proper to be adopted by a private perſon, would be too expenſive for a conſiderable magazine of corn, on account of the number of ſacks which would be required.

I acknowledge that a conſiderable number of ſacks will be neceſſary, yet is not this ſo expenſive an article as may be imagined.

If the ſacks are bought at the firſt hand, they will coſt leſs than a ſhilling a piece, and, with care, they will laſt long enough amply to repay their firſt coſt.

The ſacks certainly contribute to preſerve the corn in good order, prevent waſte, and are a ſecurity againſt private embezzlements. Laſtly, as they are very eaſily removed, the corn may more certainly be ſaved in caſes of ſudden fire or inundations. On the contrary, in theſe caſes, how many difficulties are there to ſurmount when the corn is kept in large heaps in a granary.

Having no deſire to form a ſcheme of a public nature, I have been content honeſtly, and in plain terms, to relate, what I have come to the knowledge of by many years experience, and to lay open the inconveniencies which may attend the laying up of Wheat in the methods hitherto practiſed.

This object is of too great importance for me to be under any apprehenſion, that any one will think meanly of me for writing on the ſubject.

I have omitted all long diſquiſitions, leſt I ſhould have extended this paper to too great a length.

For inſtance, if we exclude the air and light, no inſects will annoy the corn; but can we at the ſame time be ſecure, that the Wheat will not ferment, grow muſty, and ſuffer ſome alteration for the worſe?

By guarding againſt the action of the air, we do not exclude the air itſelf, which is too ready to enter at every crack.

When air is not in motion it contracts a kind of corruption; is it not then natural, that it ſhould communicate this corruption to bodies containing air? Let a dungeon, which has been long cloſely ſhut, be opened, and a diſagreeable ſtrong ſmell will ſurely iſſue from it; we muſt then conclude that a circulation of the air is neceſſary: the only queſtion remaining is, how far this circulation may be permitted to take place, ſo that the alterations may not be too ſudden.

ARTICLE. XIV.

An Eſſay on the Obſervations which might be made reſpecting the Variations in the Atmoſphere accompanying and preceding the different Seaſons of the Year. Written by M. F. Micheli du Cret, *Member of the Council of Two Hundred in the Republic of Geneva, in a Letter to* ******.

“ YOU have impoſed on me, my dear Sir, a taſk which it is out of my power to perform. I am not naturaliſt good enough, neither have I made ſufficient obſervations in the matter, to give you any information reſpecting the theory of the land winds, and the effects which reſult from their various combinations, with regard to the general temperature of a climate, or to agriculture.

“ I have long formed an imagination, that, by placing obſervers on the various heights which form the part of the world we inhabit, from the ſeas to the higheſt mountains, and from thence deſcending again to the level of the waters, it would be poſſible to form ſome probable concluſions reſpecting the prognoſtics of the ſeaſons.

“ This idea, chimerical as it may appear, is amuſing to me; how ſurpriſing would it be to ſteal, as it were, this ſecret from nature? Mathematicians ſearch for the quadrature of the circle, and navigators for the longitude; neither have yet ſucceeded, yet have their endeavours been of uſe to ſociety. The ſame, perhaps, might be ſaid of my idea, reſpecting the prognoſtics of the ſeaſons. We ſhould diſcover, probably, what we were not in ſearch of; and if we diſcovered nothing, we ſhould, at leaſt, have the ſatisfaction of knowing, that farther enquiries into this matter were vain. It ſeems to me, that if we could have extenſive Meteorological tables, they would greatly forward this work.

Hitherto I have ſaid no more than any body elſe might have told you: I perceive, nevertheleſs, that I have ſome confuſed ideas of this matter, which I ſcarcely know how to pen.

As they are only for your own reading, (for you will ſoon be ſenſible that they ought to extend no farther) I ſhall take little heed of the order in which I ſet them down.

The courſe of the ſun governs that of the ſeaſons; when it is at the loweſt point, we have the winter ſolſtice, and when it is at the higheſt, the ſummer ſolſtice. If the globe we inhabit was perfectly round, and had no inequalities on its ſurface of mountains or hills, probably the variations of the ſeaſons would be leſs conſiderable, and fewer in number. A powerful cauſe operating continually without obſtacle, would almoſt always produce the ſame effect; let us then be thankful to Providence for the rugged ſurface with which our globe is ſurrounded. The high mountains, as you have on another occaſion obſerved, ſerve inſtead of columns to ſupport thoſe large reſervoirs of water ſuſpended in the air, ever ſince the creation of the world, to ſerve the occaſions of mankind. Theſe ſame collections of water, agitated by the winds, of which they are at once the cauſe and effect, moiſten the earth, and thereby give it fertility; the low mountains alſo, and the little hills, contribute to this effect. The courſe of nature is regulated by the laws of gravatation alone, and by theſe laws is every part of it kept in due order.

But theſe reſervoirs would not afford ſufficient moiſture for the earth we inhabit, if the Omnipotent Being had not alſo made reſervoirs of water in the boſoms of the higheſt mountains to form rivers, and if he had not provided, for the ſupply both of the firſt and the laſt, the immenſe depths of the ſeas, whence the ſun, by the ſole power of its attraction, raiſes vapours without ceaſing, which impelled by the action of the winds, are blended with the clouds, and form that wonderful order ſo well adapted to continue fertility to the earth, and ſupply the inceſſant wants of its inhabitants.

The condenſation and rarefaction of the air in this manner, form the whole courſe of nature. Other laws, to us unknown, may perhaps have their influence; but it, nevertheleſs, appears to me, that this ſingle principle is ſufficient to explain all the phenomena which are known reſpecting the action of the winds. It is certain, that the irregularities on the ſurface of the earth are the cauſes of their various motions. I conceive it to be brought about in the manner following.

Suppoſe the atmoſphere to be in as great a ſtate of reſt as it is poſſible, the action of the ſun alone will then attract vapours from all the ſurfaces it enlightens in proportion to the degree of moiſture they before contained. But as the mountains, the dry rocks, and the ſandy plains, are leſs capable of yielding a ſupply of theſe vapours than the deep vallies, it is evident that, from this inſtant, the air not having ſo much play in theſe laſt as on the heights, will begin to be heated in a greater degree. After this the clouds or vapours will collect themſelves together over the valley, and the air, being by this ſtill more compreſſed, and more heated here than in the parts around it, will attract to itſelf the circumjacent air.

That warm air will attract that which is colder we every day experience in our houſes. This fact then, which I think ſufficiently demonſtrated, comprehends, in my opinion, the cauſe of all winds, or, which is the ſame thing, the agitation of the air.

The earth by its form, and the ſun by it courſe, have occaſioned that ſome places are conſtantly either hotter or colder. The inhabited countries near the poles, and the tops of high mountains, are evidences of this. On the other hand, the equator, and all that part of the earth as far as the tropics, is, if we except the mountains, hotter than the temperate zones. The poles on the one hand, and the equator on the other, are then ſufficient to cauſe a continual attraction and repulſion of the atmoſphere; and there is great reaſon to think, that this cauſe occaſions, either wholly, or in part at leaſt, the trade winds in different latitudes. But as we are now only treating of land winds, providence, which ſeems to have made Europe more proper to be inhabited in all its parts than the other quarters of the world, has placed it almoſt entirely in the temperate zone, and has more interſected it with ſeas than Aſia; the center of it is leſs elevated, and the ſeveral chains of mountains which croſs it are ſo aptly ſituated, that they every way contribute to its being refreſhed by moiſture, inſomuch that few places are uninhabitable for want of water. The inequalities of the ſurface of that part of the earth (Switzerland) we inhabit being ſo great as we know them to be, the conſequence ſhould every day prove an infinity of variations and modifications in the undulations of the air, particularly if we add to them the ever varying action of the courſe of the ſun.

Experience indeed convinces us, that at the time of the ſolſtices, or at leaſt ſoon after them, when the ſun is nearly oppoſite to the earth, the weather is leſs ſubject to great changes. As ſoon as the winter is well ſet in, the northerly winds, or which is the ſame thing, the air which comes to us from the polar circle, greatly influences our climate.

If there is at any time, in that ſeaſon, a violent return of the ſea or ſoutherly winds, it is a rare inſtance, and well worthy of being examined into by a chain of obſervations and obſervers; but the infrequency of the exception ſerves to eſtabliſh the rule, ſo that we may ſay, that in the winter ſeaſon, we are generally ſubjected to the northerly winds; and if ſometimes our vanes ſeem to indicate a ſouth wind, it only takes its riſe from the heights of our mountains, and is cold in proportion, as it glides over the ſnows and ſleet which fall on their ſummits.

This wind is not warm, except it comes to us from a greater diſtance, as from the Mediterranean, and ſometimes from the tropics. Its duration and violence in ſurmounting the obſtacles it meets with in its way, ſufficiently indicate to us the ſtrife it occaſions in the atmoſphere, to clear the way it has already paſſed, and that which it ſtill has to paſs.

This circumſtance, which is very rare in the winter, becomes more frequent in proportion as we advance towards the ſpring. After the middle of February, we begin to ſee the firſt efforts which nature makes to deliver itſelf from the yoke it has long ſubmitted to, but theſe firſt efforts have much the ſame effect, as with people who have been in the ſame ſituation, failing of ſucceſs they contribute to make the yoke ſtill heavier.

The firſt efforts of the ſea winds ſerve only to bring on us, in February and March, a more violent reaction of the northerly winds; becauſe all that part of the world being yet frozen, the air which comes to us from thence, by a violent undulation, muſt neceſſarily partake of the nature of the place whence it takes its riſe.

As we advance forwarder in the months of March and April, the ſtruggles become more frequent, and the ſucceſs more dubious.

If unfortunately the ſoutherly winds remain maſters of the field of battle for any conſiderable ſpace of time, they forward vegitation, the plants advance in their growth, and the buds of the vines begin to unfold. I ſhould be inclined to think, that at theſe periods (and experience ſeems to confirm me in the opinion) this alteration of the air is perceived as far as the ſeas of Holland, and even to the Baltic; but the triumph is of no long continuance. At the firſt rains which fall from the Alps, there enſues a violent attraction of the air from the pole, which is not yet thawed, the froſts return, and the young ſhoots of the plants, with the buds of the vines, are effectually deſtroyed.

You will perhaps aſk me if I am quite certain this is nature's courſe? To this I ſhall anſwer, that it poſſibly is ſo, and it is to gain ſome inſight reſpecting this matter, that I could wiſh ſome obſervers were properly ſtationed, and their obſervations compared. For though this courſe may have infinite variations, occaſioned by many different cauſes, moſt of which are to us unknown, yet ſuch part of it as is always the ſame, induces me to preſume, or at leaſt to conjecture, that there is more uniformity in this variety, than is in general imagined.

By the middle of May, or thereabouts, the face of nature ſeems entirely changed. If there is ſtill any reſiſtance in the extreme parts of the earth, the conflict is not in our country and at our expence, the northern parts being almoſt thawed, and the ſun got to a conſiderable height. The ſhips which go on the whale fiſhery, when they enter the ſeas of Spitzberg, meet, they ſay, with violent tempeſts, accompanied with ſleet, but this is naturally to be expected.

The operations of Nature, in this country, yield not towards the end of the ſpring to the great impulſions of the air; but then they are ſubject to others, which, though particular and local, equally merit our attention.

If the courſe of the ſeaſons was now ſuch as it was deſcribed by our anceſtors, we ſhould have warm rains in April, and plentiful dews, accompanied with heat, in May. But this courſe we have long been unacquainted with.

We are pretty well freed from the danger of froſt in May, when the dews begin to fall plentifully in that month. We had none in 1762, but in their ſtead a north-eaſterly wind, which held twenty-two days.

We have now fine ſprings, but dry and windy; by which weather, if the vines are benefited, other plants are injured.

Many people in England imagine, that the cutting down the foreſts of Norway and Sweden occaſions this deſireable ſeaſon to be backwarder; for, ſay they, the north winds have a freer courſe, and prolong their viſits to us. A melancholy conjecture for poſterity, if it ſhould prove true!

We have, for many years, ſuffered innumerable inconveniencies from this alteration in the ſeaſons, which inſpired me with an idea of wiſhing, that, after a courſe of obſervations, we might be able to attribute it to ſome other cauſe.

By the end of May, and the beginning of June, our evils change their nature. We are very little troubled with the dry north-eaſterly winds; but then the ſun by its great power melting the ſnow on our mountains, and heating, in a conſiderable degree, the air of our vallies, we of courſe have frequent rains. We have them too often at the beginning of June, and ſeldom miſs of them at the latter end of that month. If we had a chain of obſervers only from Geneva to Milan, I am well ſatisfied that there would be found, at very ſmall diſtances, a great variety in their obſervations. I ſhould be inclined to imagine, that theſe varieties would be occaſioned by the vallies and the different heights of the mountains, which form as it were ſtreets or paſſages for the clouds.

Lakes and rivers, and even ſprings of any conſequence, cauſe an attraction, which experience makes evident to us: we alſo know, that the weather is often fine in Italy, when we have heavy rains, and *vice verſa*.

The heavy rains which fell during the whole ſummer of 1758, were well worthy of having obſervations made on their cauſes; but as ſuch a ſeaſon very rarely occurs, we muſt not ſuppoſe it in the common courſe of nature.

Some days after the Solſtice, or rather in the firſt week in July, the great heats begin, which continue without interruption during the whole month, and ſometimes a part of Auguſt.

The more moiſture there is in the earth in the months of June and July, ſo much the more are we expoſed to ſudden hail-ſtorms.

That which is the cauſe of, and generally precedes a hail ſtorm, is what we commonly call *gleams of ſun-ſhine*, which are only the ſun's action on the vapours riſing in the vallies, and this action is more powerful when the earth is moiſt, than when the weather has been for ſome time before dry.

Theſe ſtorms do great damage, for when the hail falls in a quarter of the country, it cauſes an impetuous wind, which growing every moment colder, ſuſpends the cauſe of the evil, at leaſt for ſome days. If the ſtorm has covered a conſiderable ſpace of the country on both ſides the Jura, though at different hours, we have then almoſt always a north-eaſterly wind, which I will term local, becauſe it ſcarcely ever extends beyond the diſtricts which border on thoſe, in which the hail fell. I ſee no remedy for all this; we muſt attribute it to our being ſituated at the foot of the mountains.

We have few variations at the end of the ſummer; frequently drowth, ſometimes continual rains, which when they laſt long are always accompanied by ſnow on the Alps, and alter the weather for many ſucceſſive days.

Autumn begins the 22d of September; and if there is then ever ſo little agitation in the northern ſeas, we quickly feel it.

The September blaſts of wind are well known to the French mariners. The primary cauſe of them is the ſun's declination. The cold, which has already got poſſeſſion of the northern climates, endeavours to extend itſelf towards the ſouth. It meets at firſt with powerful oppoſition; but this it inſenbly overcomes.

The autumn is ſo far a pleaſant and agreeable ſeaſon, as we have often a long ſeries of fine days; but this is not till the weather is changed from hot to temperate.

I am inclined to think that the conteſt of this ſeaſon with that which ſucceeds it, is carried on, in our part of the world, during the whole month of October; and to this are we indebted for the fine days we enjoy in that month: *Deus nobis hæc otia fecit.*

We are alſo pretty well to paſs in the month of November, when the ſun, by declining in its height, makes the tranſition from temperate weather to the firſt degree of cold, which ſeaſon the common people call St. Martin's ſummer. In this manner do our ſeaſons ſucceed one to the other.

I have ſaid a great deal on this ſubject, but perhaps it may be thought to little purpoſe. I imagined I ſaw ſomething worth attention in this matter, and I am ſtill of the ſame opinion; but I am at the ſame time ſenſible, that were my ideas carried into execution, many would deem them chimerical.

I ſhould be glad if you could for the preſent ſet on foot two correſpondencies; one on the Mount Jura, in a pariſh near the Lake of Joux, and the other beyond Berne, up the Aar, near the lakes

Thoun and Brientz, as high up as poſſible. If you could alſo fix ſomebody in one of the Italian bailiwicks, it would be a conſiderable point gained.

A few years obſervations on the Lake of Joux, would ſerve either to corroborate my conjectures on the ſummer rains and winds, or would entirely confute them; the two laſt might teach us ſome curious particulars reſpecting the other ſeaſons, eſpecially ſpring; and indeed I muſt needs own, it is principally for this laſt purpoſe that I could wiſh proper ſtations for obſervations were appointed.

P. S. One of the firſt remarks you will probably make on theſe looſe hints which I ſend you, will be, that if any one at Berne, or in any other place, ſhould be inclined to deſcribe, as I have done, the courſe of the ſeaſons, their account would be different from mine. It doubtleſs would be ſo, at leaſt with reſpect to many parts of it; and it is this difference, this variety, which being combined after a certain time and frequent obſervations, that would probably give us a knowledge of ſome uſeful and practical truths. If, on the contrary, nothing but doubt and uncertainty ſhould reſult, poſterity would at leaſt know, that we had made ſome fruitleſs reſearches to acquire knowledge on this ſubject. This laſt winter, (1762) has been remarkably mild, inſomuch that it is worthy of remark. The ſevere cold came from the north-eaſt as far as our lake, (of Geneva) but did not enter it. A conſtant fog, occaſioned probably by the vapours which ariſe from the lake, ſuſpended its operations, or rather prevented it from paſſing mount Jura.

We had about nine or ten inches ſnow in the valley that ſurrounds Geneva, and this ſnow lay five or ſix weeks on the ground, at a time there was ſcarcely any on the mountains, and very little, as they ſay, in Switzerland.

The thermometer was pretty conſtantly from three to five degrees below Zero, once or twice eight degrees; but it was when the fog entering the pores of the glaſs, put the thermometer into a kind of an artificial bath: at ſuch times, every ſubſtance which it affects feels it ſenſibly, and in my opinion they are then ignorant of the true, time who truſt to inſtruments for information.

You may eaſily, from the principles I have laid down, form a probable conjecture reſpecting the cauſe which prevented us from feeling the ſevere cold weather our neighbours to the north experienced. The weather in December was mild, and not ſubject to variation, no violent undulation coming from the ſouth, as we frequently have about Chriſtmas: we, by this means, eſcaped the reaction of the northerly winds in January; the ſevere winters of 1709 and 1755, were to be aſcribed to this cauſe alone. From hence we may naturally conclude, what I have been endeavouring to prove, that the action of the winds has a great influence over the temperature of our air.

ARTICLE. XV.

Enquiries into the Nature of ſuch Diſtempers as make Wheat black, particularly the Smut, properly ſo called, and the Charbon or burnt grain. Extracted from the Elements of Agriculture, writen by Monſieur DU HAMEL.

To the Authors of the Foreign Eſſays on AGRICULTURE *and* ARTS.

GENTLEMEN,

AS you invite your readers to correſpond with you, and ſend you ſuch tranſlations as may anſwer the purpoſes intended by the plan you have laid down, I accordingly take pen in hand to make a few remarks on the Smut, as it is generally called in England, which often ſo greatly damages the crops of our farmers.

This diſtemper is very little underſtood on our ſide the water; no enquiries, or at leaſt very few, having been made into its cauſes, and the manner in which the crops are infected is alſo as little known.

Moſt farmers confound together two different diſtempers, namely the Smut and burnt grain.

This laſt is what commonly goes by the name of Smut in England, the other being comprehended under the ſame general appellation. We ſhall, however, call that the Smut which is not infectious, herein following the example of the French; the other we ſhall call burnt grain.

It muſt not appear ſurpriſing, that farmers ſhould have confounded theſe diſtempers, there being many circumſtances relative to them which might ſeem in ſome ſort to favour ſuch an opinion.

I. The ſmutty and burnt grain are both met with in the ſame fields.

II. When the grain is much infected with the Smut, a great number of burnt ears are generally found; theſe two diſtempers very commonly come together.

III. Theſe two diſtempers attack ſeveral kinds of grain, the ſubſtance of which is farnaceous.

IV. In both diſtempers the farinaceous ſubſtance is converted into a powder more or leſs black, and of a bad ſmell.

Theſe diſtempers have, nevertheleſs, characters, which ſhould diſtinguiſh them one from the other; for this reaſon in the extracts which follow, Monſ. Du Hamel treats of them ſeperately.

This able naturaliſt, conjointly with his countryman M. Tillet, has carefully inveſtigated the nature of theſe diſtempers, and the reſult of his obſervations, like a true citizen of the world, he has publiſhed for the benefit of mankind in general.

The extracts I herewith ſend you are ſomewhat long, and as the ſubjects are pretty fully handled, I ſhould not do right to take up a number of pages with any obſervations I could make, for which reaſon I conclude myſelf, Gentlemen, your very humble ſervant,

Dover, *Feb*, 7, 1765. AGRICOLA,

Of the Smut, properly ſo called.

There are three points to be conſidered: the characters of the Smut; the cauſes of it; and the means of preventing it,

Characters

Characters of the Smut.

Since 1751, we have obſerved in the Smut, properly ſo called, the following characters.

I. This diſtemper entirely conſumes the germ and ſubſtance of the grain.

II. It does not only affect the ear, but the whole plant is in ſome meaſure affected when the diſtemper has got to a great height.

III. When a plant of Wheat is attacked, it is very rare to find an ear on any of the ſtalks exempt from it.

IV. In March and April, by carefully opening the ſheath that covers the ear, and by examining the little ear which was not then above two lines in length, and was near the root, I have perceived the embryo already black, and attacked with this diſtemper: perhaps the other plants might have been infected later.

V. When the ear comes out of the hood, which the leaves form for it, it appears ſmall and lean; the teguments of the grain are ſo altered, that the black duſt appears thro' them; and thenceforward, inſtead of the grain, nothing is to be found but a black ſtinking duſt, without ſubſtance.

As the particles of this duſt have little coheſion, and the teguments are deſtroyed, it is eaſily carried away by the wind, or waſhed off by the rain; ſo that nothing is generally houſed but the ſkeletons of ears; if any of the duſt remains, it is taken off in the ſifting, and I have not found it contagious like that of burnt grain.

M. Tillet has alſo obſerved, that corrupted ears are often found in the ſheath, tho' the ſheath, which appears green and well-conditioned, has no ſigns of a decay.

The upper part of the ſtalk of ſmutty plants is ſeldom ſtraight at about half an inch beneath the ear,

ear. On preſſing the ſtalk in this ſpot, it reſiſts, and ſcarcely yields to the finger.

On cutting the ſtalk two or three lines beneath the ear, it proves almoſt entirely full of pith; ſo that a very ſmall aperture is to be perceived at the heart, whereas in ſound plants this aperture is large.

M. Tillet has hence concluded, that ſmutty plants are choaked up at the top of the ſtem.

Bearded wheats are as ſubject to Smut as thoſe that have no awns. But neither M. Tillet nor myſelf have found any ears of rye ſmutted.

Enquiry into the Cauſes of Smut.

The Smut cannot, as has been hitherto imagined, proceed from the grains not being impregnated, ſince it affects and deſtroys the organs which diſtinguiſh the ſexes of plants long before the time of impregnating.

It can neither be attributed to the wet hanging on the ears, to fogs, nor the heat of the ſun; ſince we have ſeen ears ſmutty long before they were diſengaged from the coverings afforded them by the leaves, which ſtill continue green, if the diſtemper is not got to any great height.

Theſe ſame obſervations abſolutely overturn the opinions of ſuch as think that the cauſe of the Smut is to be found in the grain already formed, but as yet of a milky ſubſtance.

It has been pretended that the dampneſs of the ſoil will occaſion Smut; but it is not perceived that corn is more ſmutty in the bottoms of fields than in parts that lay higher; beſides, why ſhould one diſtempered plant be found amongſt many that are healthy? Yet, as it appears that grain is more ſubject to ſmut in wet, than in dry years, it is poſſible that, though wet is no immediate cauſe of Smut, it may be favourable to the progreſs of the diſtemper.

Some Naturaliſts have aſcribed this diſtemper to inſects. If I cannot abſolutely contradict this, I can, at leaſt, aſſert that, being at firſt of that opinion, all the reſearches I could make to eſtabliſh its reality were of no effect.

I have, it is true, been ſhewed ſome Staphylins, and other inſects on ſmutty ears; yet, as I found the like on thoſe that were healthy, I conclude, with M. Tillet, that theſe inſects are in no reſpect the cauſe of this diſtemper.

We are ſenſible that the corn-caterpillar deſtroys the farina, yet it does not cauſe the Smut.

Many flies depoſit their eggs in theſe ſeeds; worms proceed from them and gnaw the ſeed; but we do not obſerve that they occaſion any thing like the Smut.

M. Hales, being willing to try whether grain bruiſed with the flail became ſmutty, choſe a certain number of the ſeeds of different ſizes, and bruiſed them with a hammer; this ſeed ſprouted, and bore ears that were not ſmutty.

An experiment, made by ſo able a Naturaliſt, ſubverted in this manner an opinion that had been formed on the cauſe of this diſtemper.

The dung of pigeons and ſheep have by ſome been thought to cauſe Smut; but without reaſon. We have large dove-houſes, the dung of which is ſpread on our Wheat-lands, where our ſheep's dung is alſo laid, and we even fold our ſheep there; yet it is not obſerved that theſe fields are more ſubject to ſmut than others. This opinion is therefore void of all proof.

M. Wolf imagined that Smut was occaſioned by the unnatural form of the embrio: but M. Aimen has refuted this opinion, by demonſtrating, that in certain plants the male flower is attacked by the Smut; and theſe flowers have no embrio.

M. Aimen has very judiciouſly obſerved, that the Smut cannot be owing to any defect in the ſap, as all the parts of the plants, excepting the ear, appear healthy, and there are plants perennial in their roots, which ſeem very vigorous; yet is their ſeed every year ſmutty.

This ſame Naturaliſt, who has made ſome uſeful reſearches into the cauſe of the Smut, properly ſo called, ſays, that this diſtemper ariſes from an ulcer which, in the firſt place, attacks the ſtamina of the ſeed, and afterwards infects the different parts of the flower. But the remote cauſe of this ulcer will, perhaps, be required.

To diſcover this cauſe, M. Aimen examined ſeveral barley corns with a magnifying-glaſs; ſome were larger than others; many were hard, others yielded to the preſſure of the nail: ſome were of a deep, others of a light colour; many were oblong, ſome rounder; their huſks were cracked in ſeveral places; whereas in a natural ſtate this part is ſmooth and even: finally in ſome he perceived black ſpots, and through the magnifying-glaſs theſe ſpots appeared to be covered with mould.

Theſe barley corns were carefully ſorted, laid in little heaps, and ſowed a part, but in the ſame land.

All the grains that were mouldy produced ſmutty ears: the parched and ſhrivelled grains, and ſuch as had been attacked by inſects, either did not come up at all, or were not ſmutty.

He then took ſome ſound and healthy grains; he ſowed them, and ſome time afterwards took them up to examine them with the glaſs; ſome of them he found mouldy, and, putting them again into the ground, they produced ſmutty ears.

M. Aimen, without aſſerting, that there is no other cauſe of Smut, concluded from the experiments above mentioned, that mouldineſs is one of the cauſes of the Smut.

It is not eaſy to conceive that this mouldineſs, or, if you will, this kind of moſs, is capable of cauſing this diſtemper; for as ſoon as the grain has ſprouted, and formed its plant, the whole ſubſtance of the ſeed is exhauſted.

Whether the huſk rots or not, ſeems to be of little conſequence to the plant, as it no longer depends for ſubſiſtence on the ſeed which had hitherto ſupported it. It is eaſily conceived that mouldineſs may either kill a plant, or make it weakly. But it is not ſo apparent how this mouldineſs can affect the organs of fructification only, and totally deſtroy them, without any other parts of the ſame plant being viſibly affected; and this, though the plants ſhould even be perennial.

As to the reſt, M. Aimen relates facts; and, in ſome meaſure, to account for them, one might conjecture, on a ſuppoſition that the growth of plants is only an unfolding of their parts, that the organs of fructification, which exiſted though imperceptibly in the ſeed, were affected with mouldineſs before the grain was put into the ground.

But let us keep to well-obſerved facts: it is of much more importance to collect them, than to be in haſte to explain them by conjectures, which hitherto have been little founded on probability.

Methods of guarding againſt this Diſtemper.

To prevent this diſtemper, M. Aimen recommends that the fineſt and ripeſt grain ſhould be choſen for ſeed; that it be thraſhed without delay, and immediately limed, either to prevent its becoming mouldy, or to deſtroy the mould, if already formed.

According to this principle, the lye recommended by M. Tillet ſhould be equally ſerviceable in preventing the Smut, and preſerving the ears from being burnt.

We ſhall make no addition to M. Aimen's advice, not having obſerved ſo much the nature of Smut as of the Charbon, or burnt ears. As this laſt diſtemper is much more terrible than the other, it has chiefly engaged our attention.

According to ſome obſervations made by M. Tillet, it does not appear that the black duſt of the Smut, properly ſo called, is contagious: and we ſhould ſpeak more deciſively in this matter, could we have collected a ſufficient quantity of this black duſt; but, as we have already ſaid, there is little to be found in the barns, on account of its being before carried away by the wind and rain.

We recommend it to the lovers of Agriculture to make freſh trials, in order to find whether Smut is really contagious; but we warn them not to confound the Smut, properly ſo called, with the Charbon or burnt ears: this has led many Naturaliſts into errors.

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ARTICLE XVI.

Of the Charbon, or Burnt Grain.

THIS diſtemper of corn is confounded by almoſt every writer on the ſubject with the Smut, properly ſo called: it is, nevertheleſs, very different, and much more dangerous.

The Smut, properly ſo called, occaſions the total loſs of the diſtempered ears; but as the black duſt is very fine, and the particles of it have no coheſion, the wind and rain carry it off, ſo that ſcarcely any thing is houſed in the barn but ſtraw, which is not infectious, and does very little damage to the flour.

The Charbon, or burnt grain, is, on the contrary often laid in the granary with that which is ſound, to which it communicates a contagious diſtemper, and alſo darkens the flour, and gives it a bad ſmell.

Characters of the Charbon, or Burnt Grain.

The characters of this diſtemper are,

I. The plants that produce burnt ears are ſtrong and vigorous.

II. The infected ears are not at firſt diſtinguiſhable from thoſe that are healthy; but when they are paſt their bloom, they appear of a deep green colour, approaching to blue; they afterwards become whitiſh, and are then eaſily known.

As this change of colour is effected by the ſun, when a number of white ears have been ſuddenly perceived in looking over a wheat-field, the ſun's heat has been often thought to cauſe this diſtemper, or a fog preceding that heat.

III. Though all the ears produced from one grain are commonly infected, yet M. Tillet, Aimen, and myſelf, have met with ſound ears on plants that had produced others which were infected. We have even found ſome ears, part of which only were viciated, and finally ſome grains encloſing partly a white flour, the remainder black duſt.

IV. In burnt ears the chaff, or outward coat, was commonly ſound, with this ſingle difference, that when the ears were near ripe, it appeared more withered and dry than in the healthy ears.

V. The bran which immediately encloſed the grain is not deſtroyed, as it is in the Smut, properly ſo called; but has conſiſtence enough for the grain to preſerve nearly its natural form, with a whitiſh look.

VI. The burnt grains are ſhorter, rounder, and lighter than ſuch as are uninfected: they are ſometimes larger, ſometimes ſmaller. The furrow which runs the length of a grain of wheat is ſometimes totally effaced, at others is viſible: the piſtils at the extremity of the grains are dried up.

VII. The bud of burnt grains is not viſible.

VIII. Till the blooming ſeaſon, there is very little difference betwixt the burnt grain and that which is healthy: they are only a little more ſwelled. But, in the blooming ſeaſon, the infected ears aſſume a bluiſh colour; the chaff is more or leſs ſpecked with ſmall white ſpots: the grains are of a deeper green, and larger than in a ſtate of Nature; and, as long as they preſerve that colour, they adhere ſtrongly to the chaff.

The diſtemper has often attacked very young ears whilſt yet encloſed in the ſheath. The ſtamina on the ſides of the grain are then dried up and ſickly; the embryo in part takes the deep green colour above-mentioned; the infected ears have not the conſiſtence of thoſe that are healthy; in the ſame meaſure the diſtemper advances, the chaff becomes dry and whitiſh.

IX. The grains have ſome degree of firmneſs. On opening them, which may eaſily be done with the nail, there appears an unctuous, dark brown, ſtinking ſubſtance, not at all reſembling the light duſt of ſmutty ears; the duſt of burnt grain has ſome coheſion, and through a microſcope appears to conſiſt of larger particles than that of the ſmutty ears,

X. Some time before the blooming ſeaſon the grains appear to be filled with a whitiſh ſubſtance, a little burnt towards the bottom, and this colour extends by degrees over the whole ear: the grain then appears divided, as it were, into equal quarters by furrows; which diſappear as the grain encreaſes in ſize.

XI. By what has been ſaid, it is evident that Smut infects corn much ſooner than the Charbon.

XII. Grains that are much burnt are evidently incapable of ſprouting. But I have had ſome ſound grains taken from an ear greatly burnt, which, in a kitchen-garden, have produced very ſtrong plants; and, though the birds diſturbed my experiment, it appeared to me that there were ſome ſound ears amongſt many more that were infected.

XIII. A part of the burnt grain is bruiſed by the flail, and their black duſt is ſcattered over the ſound grain; this unctuous duſt chiefly ſticks to the hairy extremity of the grain near the bud, and there forms a black ſpot. Corn ſo affected is called Spotted Grain: many of the grains which eſcape the flail remain entire, on account of their lightneſs; a great deal is ſeparated by caſting, but the ſpotted grains remain as well as many that are burnt; and this is enough to darken the flour, and give it a taſte.

XIV. To remedy this inconvenience, and make the beſt bread, they paſs the corn through drum-ſieves (*cribles à tambour*) made of pierced iron plates, like the graters with which they raſp tobacco; the corn is then waſhed, and all the light grains that ſwim ſkimmed off, which are for the moſt part burnt. The water takes off the ſpots, which are but ſuperficial; for if a ſpotted grain is wiped, the ſpot immediately diſappears.

Of the Cauſe of the Charbon, or Burnt Grain.

With reſpect to the cauſe of this diſtemper, I confeſs we are hitherto as much at a loſs as in the caſe of Smut. Some have attributed it to dung; others to fogs; many to the heat of the ſun; ſome to inſects; others to the moiſture of the land; and not a few to the ſeed being unripe: but theſe opinions are confuted by good obſervations, and by experiments very carefully made. We refer to what has been ſaid of Smut.

It may ſeem improbable that a mere ſuperficial duſt, which only ſticks to the bran, without penetrating the grain, ſhould be ſo contagious as to infect all the grain it touches, with a diſtemper; what is more ſurpriſing is, that it ſhould injure the organs of fructification only.

Yet, however improbable this may appear, the experiments made by M. Tillet put it paſt a doubt; they ſhew that the Farmers are not without reaſon cautious in avoiding to ſow ſpotted grain.

As it would take up too much room to mention, at large, all the experiments made by M. Tillet, which are to be found in the papers publiſhed by him on that ſubject, I ſhall content myſelf with relating the reſult of theſe experiments, and the inferences this able Naturaliſt draws from them.

Several writers having mentioned dung as the immediate cauſe of this diſtemper, and others having aſſerted that it was hereditary, all M. Tillet's experiments were calculated to clear up theſe two points: he was at the ſame time in hopes, by means of the ſame experiments, of finding ſome method of guarding againſt this terrible diſtemper.

I. The ſeveral kinds of dung had no viſible effect in producing burnt grain. The infected ſeed produced as much burnt grain in the ground that was not dunged as in that which was. He did not find that dung had any effect either in favour of, or againſt the diſtemper.

II. Dung made of the ſtraw of infected grain, did not ſeem to communicate the diſtemper; bu tthe infected ſtraw unrotted ſeemed to communicate it. Yet the effect was moſt viſible when the duſt of burnt ears was mixed with the earth.

III. All grain naturally ſpotted, whether it grew on the land, or was brought from another place, bearded wheat, ſummer-wheat, and wheat without awns, produced a great deal of burnt grain.

IV. Picked wheat taken from the fineſt ears, and carefully ſelected grain by grain, that none of it might be infected, being ſowed, ſome in dunged, and the reſt in undunged beds, without having received any preparation, yielded little or no burnt grain.

V. Some of this ſame picked wheat, being ſprinkled with the duſt of burnt grain, produced as many diſtempered ears as that which was naturally ſpotted.

VI. The picked wheat, being prepared with lime and a ſolution of the ſea-ſalt, yielded ſtill fewer infected ears than when unprepared.

VII. There were ſtill fewer from what was prepared with lime and nitre.

VIII. Early or late ſowing ſeemed to be a matter of indifference.

IX. It appears by M. Tillet's experiments, ſeveral times repeated, that the duſt of burnt ears is contagious, ſince ſound wheat ſprinkled with it, or ſowed in rills in which that duſt had been put, produced a great number of infected ears.

He alſo found that this duſt, tho' expoſed to a ſtrong heat, as of ſixty degrees, is ſtill contagious, unleſs it is abſolutely burnt by the fire when it has not that effect.

Tho' it is kept for years, its infectious quality continues as ſtrong as ever.

X. Some farmers waſh the ſacks in which they put their ſeed. And it appears by M. Tillet's experiments, that they are in the right; for, if the ſacks had any of the duſt on them, it would certainly infect ſome of the ſeed corn.

XI. M. Tillet thinks he has obſerved, that the infected plants are more ſuſceptible of injury from froſt than others.

If this is the caſe, hard froſts muſt be ſerviceable, ſince by deſtroying the infected plants, they would have the ſame effect, as if ſuch plants had all been pulled up.

The land being cleared of theſe uſeleſs plants, would be better able to ſupply ſuch as were ſound with nouriſhment, and the crop would be exempt from infected ears, which are a great hurt to it.

XII. The black duſt ſo contagious to wheat, is not ſo to rye or bere; but the duſt of darnel is pernicious to wheat.

XIII. Smyrna wheat is leſs ſubject to this diſtemper than other grain; but ſummer-wheat is greatly injured by it.

Methods of guarding againſt this Diſtemper.

It muſt be allowed that the knowledge which has been acquired of the cauſe of this diſtemper, has put the curious obſervers in a train of finding proper preſervatives.

In fact, as the duſt of burnt grain infects all the grain it touches, it is probable that every method ſhould be deemed efficacious, which is capable of taking away this duſt, provided the virus has not from its firſt contact affected the interior part of the ſeed intended to be ſowed. In this caſe, ſieves, and waſhings with fair water, which in many places are uſed on ſpotted grain, may be mentioned as efficacious preſervatives, as well as lime-water, which our farmers uſe, the ſtrong brine uſed in ſome provinces of France, and the ſolution of arſenic, of which ſome perſons have made ſuch a ſecret; all theſe preparations ſhould be of ſervice; and, according to M. Tillet's experiments, they are ſo: yet they are often inſufficient.

This point, therefore, merited to be cleared up by particular experiments, and with all neceſſary care.

M. Tillet ſet about it with ſpirit, and the following are the inferences that may be drawn.

I. The effect of the black duſt on the ſeed is only ſuperficial till it is put into the earth, not at all affecting the interior parts.

II. Therefore every means that can tend to clear it of the duſt, muſt be of ſervice to keep it healthy, and free from the diſtemper.

III. Grain perfectly free from this, and from rottenneſs, will yield no diſtempered plants.

IV. Grain blackened with this infectious duſt, may be made healthy by clearing it of ſuch duſt.

V. Sifting ſeed, and waſhing it in ſeveral waters, leſſen, it is true, the effects of the contagion; but this is not ſufficient, as many infected plants will be produced, tho' the ſeed was waſhed in ſeveral waters.

VI. Lime, which is more efficacious than water, is not always enough ſo. I ſhall obſerve, on this occaſion, that ſeed was formerly limed in a manner different from what it is now.

The ſeed was then put into baſkets, which were plunged into lime-water very hot. The ſeed was ſtirred in the baſkets, and all that ſwam on the water was taken out with a cullender; by this means they got rid of the infected grain; and the good ſeed was better cleaned, than by only throwing as they do now, lime-water on a heap of ſeed, which is then ſtirred with a ſhovel, or by only mixing the ſeed with the ſlacked lime, reduced to powder.

One of our farmers, a careful man, being obliged one year to ſow ſpotted ſeed, he limed it by immerſion, in the manner above deſcribed; and the year following had no burnt grain.

Some experiments made in the country of Caux, by M. de Gonfreville have been publiſhed; they evince the good effects of lime uſed in the manner we have mentioned. And what is ſtill a farther confirmation of this is, that whenever our farmers ſow ſeed that has not been limed, their fields are amazingly infected.

VII. It is a good precaution to waſh ſpotted grain in ſeveral waters; but it ſhould be ſoaked in brine, and this brine ſhould have lime ſlaked in it, by immerſion, as we have deſcribed.

VIII. A ſtrong brine of ſea-ſalt is very good, and may be employed to great advantage in countries where ſalt is a merchandize.

IX. One part of nitre to nine parts water is more efficacious than ſea-ſalt; this, therefore, ſhould be uſed where nitrous earths abound.

X. Strong alkaline lyes are ſtill better; ſalt wort, pot aſh, aſhes of tartar, lyes of common aſhes much impregnated with ſalt and human urine, or cows urine, alkaliſed by putrefaction; of theſe various articles ſuch may be choſen as are moſt common.

For inſtance, in Normandy, aſhes of ſea-wrack, which are very cheap there, may be uſed. This, which is rejected for dying and lyes, as being more impregnated with alkaline and marine ſalt, may be advantageouſly uſed in the preparation of ſeed.

XI. As it is evident that ſeed picked with care yields very few infected grains, it muſt, of courſe, where a farmer has ſpotted grain, be of great advantage to him to change his ſeed in order to procure what is uninfected.

XII. M. Tillet's proceſs may be comprehended in what follows: if the ſeed is ſpotted, it ſhould firſt be waſhed in ſeveral clear waters, till the black is quite got off; it ſhould then be put into the ſteep. If it is not ſpotted, ſoaking it in the following liquor will be enough. Make ſome lye, ſuch as is uſed for linen, in a bucking-tub, putting four pounds of water to every pound of aſhes.

If one hundred pounds of aſhes are uſed and four hundred pounds of water, there will be two hundred and forty pounds of lye, to which muſt be added fifteen pounds of lime, which will be enough to prepare ſixty French buſhels of wheat, (20 Engliſh.)

When this ſteep is to be uſed, it muſt be heated as hot as you can bear your hand in it; the ſeed, being put into baſkets, muſt be plunged into it, and ſtirred with a ſtick; the baſkets muſt then be raiſed and kept up by ſticks on the edge of the bucking-tub for the lye to drain; the ſeed being thus prepared muſt be laid on the floor of the granary till it is dry enough to ſow.

If it is prepared long before it is wanted, it muſt be, from time to time, ſtirred with a ſhovel to prevent its heating; with this precaution it may be kept a month, or even a whole year.

We prepared ſome ſeed in this manner at M. Taponat's, near Rocheſoucault in 1760; and in 1761 we ſaw with pleaſure that the corn ſo prepared was uninfected, whilſt in the neighbouring fields, a fourth, a third, and even half the crops were ſpoiled by this diſtemper.

All the trials that have been made evince, that acrid ſubſtances are proper remedies for this diſtemper: I alſo believe all the ſteeps to be good; but prefer M. Tillet's as being more acrid, and leaſt coſtly.

I imagine lye that had been uſed for linen might do, only ſtrengthening it with ſome ſea-wrack, and putting twice as much lime. I know this lye to be very acrid, but cannot anſwer for its efficacy in preſerving corn from being burnt, becauſe for ſeveral years paſt we have ſcarcely had any of our grain ſo infected.

XIII. Several farmers in different provinces have uſed a ſolution of arſenic to prepare their ſeed. Great complaints have been made in all quarters of it.

Among others, a Phyſician publiſhed an eſſay to ſhew of how much importance it was to prohibit the uſe of this poiſonous ſteep. He there enumerates all the accidents that have happened to the ſowers and to the men that made the preparation, of which himſelf was a witneſs.

Since M. Tillet has given us a method ſimple and innocent in itſelf, but little coſtly and of great efficacy to clean ſpotted grain, it is to be preſumed that no body will uſe this pernicious drug, from which ſuch melancholy conſequences may enſue, if by accident any of it ſhould be mixed with the meal, and if the light corn is given to the poultry or cattle; beſides, this poiſoned ſeed muſt kill all the partridges and pigeons that eat the uncovered grain.

As ſome people are fond of making objections, it may, perhaps, be urged, that if the black duſt was ſo infectious, this diſtemper would make from year to year ſuch progreſs, that in the end we ſhould have nothing but burnt grain. But we need not be apprehenſive in this reſpect; and a year in which much corn is infected, ſucceeds one in which ſcarcely any burnt grain was to be met with. Scarcely any was to be found in the crops of 1754, 1760, and 1761.

In reflecting on this objection, which has ſome weight, I think I have found an anſwer to it in M. Tillet's obſervations, which is, that hard winters, paſt all doubt killing the diſtempered plants, ſtop their progreſs.

It may alſo be ſaid, that if this diſtemper is only cauſed by the infectious duſt, how can it at firſt get footing in a province that was before unacquainted with it?

It is readily allowed, that this diſtemper may be attributed to other cauſes beſides the black duſt: but M. Tillet's experiments inconteſtibly prove this duſt to be contagious; and his reſearches ſupply us with the means of leſſening conſiderably, if not entirely extirpating this diſtemper: thus we may have larger crops, better bread, and corn more proper for keeping.

What a ſatisfaction muſt it be to a man to have made a diſcovery ſo uſeful to his fellow-creatures, whoſe chief food is the ſeveral ſorts of grain? We ſhall ſoon ſee whether habit, ſupineneſs, and ill-judged œconomy in the farmers, will not prevent them from reaping any benefit from M. Tillet's labours, who yet propoſes to them ſimple and cheap methods of attaining an end, which to them ought to be of infinite conſequence.

ARTICLE XVII.

An account of ſome Experiments made in the Year 1760, *in the Pariſh of Surcy, the Election of Andely, in Normandy, in order to diſcover the true Cauſe of Wheat being burnt or ſmutty; with the Means of preventing this Misfortune. By M.* de Gonfreville.

Advertiſement to the Reader.

THE Society of Agriculture at Rouen was well convinced of the utility of the following paper; becauſe the method preſcribed by M. de Gonfreville, who lives in the Vexin, to preſerve wheat from being burnt, is more ſimple than any which has hitherto been propoſed.

His experiments, added to the practice of the farmers of the diſtrict of Caux, many of whom waſh their wheat before they lime it, when they ſuſpect the ſeed to be infected, ſufficiently prove that this method is infallible, when properly and carefully practiſed.

This remark is the more neceſſary on account of a conſiderable error in the firſt volume of M. du Hamel's *Elemens d'Agriculture*, lately publiſhed, where he ſays, page 327, that M. de Goufreville is ſatisfied with waſhing his ſeed in lime water. But it will appear, by the contents of the following paper, that this able cultivator particularly recommends, that the ſeed ſhould firſt be well waſhed in common water before it is put into the lime-water.

[For an account of the manner of making M. Tillet's Lixivium, frequently mentioned in the courſe of theſe experiments, *ſee the laſt article, page* 115.]

THE CAUSE of burnt or ſmutty grain was unknown to cultivators till M. Tillet, Member of the Academy of Sciences, diſcovered it; before him, ſome attributed it to the wind's blowing from certain particular points, or to certain phaſes of the moon at the time of ſowing; others to the pigeons dung, which is frequently laid on the land, or to the dung dropped by ſheep which are in the night folded on land intended for wheat.

The reiterated experiments made by M. Tillet have now convinced the world, that this misfortune ariſes ſolely from the black duſt of infected grain ſticking to to ſeed. This able naturaliſt was not content with diſcovering the evil, but he has alſo pointed out a remedy; and it muſt be allowed, that the remedy he has made publick is infallible: but the preparation of a Lixivium, and the other operations which he preſcribes, will be with ſome difficulty adopted by many. His ſentiments of patriotiſm, and his love for his country, will certainly induce him to approve of our endeavouring to render his remedy more ſimple, at the ſame time expreſſing how much we owe him; and we are perſuaded it will give him pleaſure to be informed, that waſhing the ſeed with common water, and liming in the ſame, produces the ſame effects as his Lixivium.

The experiments which I made in the ſeed-time of 1759, and which I greatly increaſed in number in 1760, evidently diſcover the evil and the remedy. Some gentlemen of knowledge, and experienced huſbandmen, who came to ſee my experiments, a little before harveſt, whilſt the corn was yet on the land, were well convinced of the truth of this.

The firſt trials I made having happily met with the approbation of M. de Brou, Intendant of the Generalité, I am thereby encouraged to give an exact account of my laſt experiments, and I the more readily impoſe on myſelf this taſk, as it will be forwarding the deſigns of a magiſtrate and a ſociety (that of Rouen in Normandy) who have the public good alone in view.

I ſhall divide this eſſay into four parts; in the firſt I ſhall exhibit a view of ſeveral plots of ground in which I made various experiments, of theſe plots I drew a plan, in which they were diſtinguiſhed by numbers.

In the ſecond part I ſhall, from this expoſition, deduce proofs of the cauſe of this evil.

In the third I ſhall point out a remedy, and in the fourth part I ſhall diſcover the method of applying it, which every farmer may eaſily put in practice. To theſe I ſhall add ſome remarks, which may poſſibly have their uſe.

An Expoſition of divers Experiments made in twenty-two Plots of Ground.

The firſt experiments I made laſt year were in ſmall, and in an encloſed piece of land, but thoſe made this year were more extended, and in the open field, on a piece of land 150 feet long and 50 feet broad, which I divided into three parts, and the whole into twenty two ſmall plots, each containing twelve rows.

Six plots, which form the firſt part, were ſown in September, the wind being in the weſt, on the third day of the full moon.

Eight plots, which form the ſecond part, were ſown the 7th day of October, the wind being ſouth, and the moon almoſt at the end of its decreaſe.

The eight plots, of which the third part conſiſts, were ſown the 17th day of October, the wind being in the north, and on the firſt day of the moon's firſt quarter.

In order to examine whether there was any foundation for the other common opinions, I put pigeons dung into ſome plots, and ſheeps dung into others. The whole will be fully explained by the account I ſhall give of the ſeveral operations in each plot, and by an expoſition of what was the reſult thereof.

FIRST PLOT, *containing four Experiments, ſown when the wind was in the weſt, the third Day after the Full-Moon.*

Three rows of ſound wheat taken from the barn were ſown, but the ſeed was firſt ſmeared with the duſt of burnt grain, and was put into the ground without being either waſhed or limed.

At leaſt two thirds of the ears, which grew in the above three rows, were burnt, and there were many ſmutty ears beſides.

Three rows were ſown with ſound wheat, but it was firſt ſmeared as above with the duſt of burnt grain, and ſown after it had been limed in the ordinary way.

Of theſe three rows about a tenth part of the ears were found to be burnt, and there were alſo eight ſmutty ears.

The wheat ſown in the next three rows was alſo ſound; it was not ſmeared with the black duſt before it was ſown, but being firſt waſhed in common water, it was afterwards waſhed with the lye, according to the method laid down by M. Tillet, and before it was covered, ſome of the duſt of burnt grain was ſown over it.

In theſe three rows at leaſt one half of the ears were burnt, and there were alſo ſeveral ſmutty ears.

The three laſt rows were alſo ſown with ſound wheat, but it was ſmeared with the duſt of burnt grain, and before ſowing, was firſt waſhed in plain water, and then ſteeped in M. Tillet's Lixivium.

There was not in theſe three rows a ſingle burnt ear, all the ears being ſound except four which were ſmutty.

SECOND PLOT, *in four Experiments, ſown on the 27th of September, when the Wind was in the Weſt, the third Day after the Full-Moon.*

The wheat ſown in the three firſt rows was very ſound; it was not ſmeared with the black duſt, and was ſown without being either waſhed or limed.

In the above three rows were only two burnt ears, and four ſmutty ears.

The three next rows were alſo ſown with ſound wheat, taken from the barn like that of the three firſt rows, and before it was ſown it was limed in the ordinary way.

There was not in theſe three rows a ſingle burnt ear, but there were two ſmutty ears.

The wheat ſown on the three following rows was alſo ſound, it was not ſmeared with the black duſt, yet was ſteeped before ſowing, but not waſhed in the Lixivium.

There was not a ſingle burnt ear in the above three rows, but there were four ſmutty ears.

The three laſt rows were ſown with the ſame wheat as thoſe abovementioned, it was not ſmeared with the black duſt, but being firſt waſhed in common water, was afterwards ſteeped in the Lixivium, prepared in the manner preſcribed by M. Tillet.

In theſe three rows there was no burnt grain, but a few of the ears were ſmutty.

THIRD PLOT, *in four Experiments, this was ſown September 27, the Wind in the Weſt, on the the third Day after the Full of Moon.*

The three firſt rows were ſown with ſound wheat not ſmeared with the black duſt; it was ſown without being either waſhed or limed, and before it was covered ſome pigeons dung was ſown over it.

In the above three rows, one ſingle burnt ear only was found, all the other ears being good and ſound.

The wheat ſown in the three next rows was alſo ſound; before it was ſown it was limed in the ordinary way, and before it was covered ſome pigeons dung was ſown over it.

Not a ſingle burnt ear was found in theſe three rows, but there were two ſmutty ears.

The three following rows were alſo ſown with ſound wheat, it was not ſmeared with the black duſt before it was ſown, but it was ſteeped in the Lixivium, and over it, before it was covered, was ſown ſome pigeons dung.

Not a ſingle ear of theſe three rows was burnt, every one of them being good and ſound.

The ſeed ſown on the three laſt rows was the ſame ſound wheat; before it was ſowed, it was waſhed in common water, and ſteeped in the Lixivium, over it was ſown ſome pigeons dung before it was covered.

In theſe three laſt rows not a ſingle ear was burnt; on the contrary, they all proved healthy and ſound.

FOURTH PLOT, *in four Experiments. This was ſown on the 27th Day of September, the wind being in the Weſt, the third Day after the Full of the Moon.*

The three firſt rows were ſound wheat, it was not ſmear'd with the black duſt, and was ſown without being either waſhed or limed; but there was ſome ſheep's dung ſown over it before it was covered.

In theſe three rows there were four burnt ears, beſides five that were ſmutty.

The ſeed of the next three rows was alſo ſound good wheat; it was limed in the ordinary way, and ſheep's dung ſown over it as before.

In theſe three rows there was not a ſingle burnt ear, but a few were ſmutty.

The wheat ſown on the next three rows was ſound, it was not ſmeared with the black duſt, and without being waſhed, was ſteeped in the Lixivium; ſheeps dung being afterwards ſown over it, but before it was covered.

There were no burnt ears found, and only three that were ſmutty

The three laſt rows of this Plot were ſown with the ſame wheat as that above mentioned; previous to the ſowing it was waſhed in plain water, and afterwards ſteeped in the Lixivium; before it was covered, ſheep's dung was ſown over it, as in the former rows.

In theſe three laſt rows there was not a ſingle burnt ear, nor one that was ſmutty.

FIFTH PLOT, *in ſix Experiments, ſown the 27th Day of September, the Wind in the Weſt, on the third Day after the Full Moon.*

The wheat ſown in the two firſt rows was ſound, but it was ſmeared with the duſt gathered up in a wheat granary, and was then ſown without being either waſhed or limed.

In theſe two rows there were found ſix ears of burnt wheat, and four ears that were ſmutty.

The two following rows were alſo ſown with ſound corn, but it was ſmeared with the duſt of a wheat granary, and before it was ſowed, was limed in the ordinary manner.

There were in the above two rows four burnt ears, and ſix that were ſmutty.

Sound wheat was ſown in the two next rows, but it was ſmeared with the granary duſt, and before it was ſown it was waſhed and ſteeped in common water, without any other preparation than ſome quick lime being diſſolved in the laſt water.

There were no burnt ears in theſe two rows, but a few ſmutty ears.

The two next rows were ſown with ſound wheat; but before it was ſown, it was ſmeared with duſt gathered in an oat granary, and was put into the ground, without being either waſhed or limed.

No burnt ears were found in theſe two rows, but there were four ſmutty ears.

Sound wheat was alſo ſown in the two following rows, but it was ſmeared with duſt from an oat granary, and was ſown without being waſhed, yet it was limed in the ordinary way.

No burnt ear was met with in theſe rows; but there were ſome ſmutty.

The ſeed of the two laſt rows was ſound wheat; it was, however, ſmeared with duſt from an oat granary; and previous to the ſowing, it was waſhed and ſteeped in common water, with quick lime diſſolved in it.

There were no burnt ears in theſe two laſt rows, but three ſmutty ears were found.

SIXTH PLOT, *in four Experiments, ſown the 27th day of September, the wind being in the weſt, and three days after the Full-Moon.*

The wheat ſown in the three firſt rows was ſmeared with the duſt of burnt grain, and was ſown without being either waſhed or limed.

At leaſt two thirds of the ears were burnt, and ſeveral ſmutty.

The three next rows were alſo ſound wheat, that had been ſmeared with the duſt of burnt grain, but before it was ſown, it was limed in the cuſtomary method, yet without being previouſly waſhed.

At leaſt, a tenth part of the wheat ears were burnt, and there were alſo ſeveral ſmutty ears.

The ſeed ſown on the three following rows, was ſound wheat, but it was ſmeared with the duſt of burnt grain; however, previous to the ſowing, it was waſhed and ſteeped in common water, without any other preparation, but quick lime being diſſolved in it.

There was not in theſe rows, a ſingle burnt ear, but there were a few ſmutty.

The wheat ſown on the three laſt rows was ſound, it was not ſmeared with the duſt of burnt grain; previous to the ſowing, it was waſhed and ſteeped in the Lixivium; and before the ſeed was covered, ſome of the above duſt was ſown over it.

One half of the ears were burnt, and there were alſo ſeveral ſmutty ears.

Seventh Plot, *in four Experiments, ſown the ſeventh day of October, the wind in the ſouth, the laſt day but one of the Full-Moon.*

The ſeed was the ſame as that uſed in the firſt plot.

The wheat uſed for ſeed in the three firſt rows was ſound; it was ſmeared with the duſt of burnt grain, and was ſown without being either waſhed or limed.

About two thirds of the wheat ears in theſe rows were burnt, and there were alſo ſeveral ſmutty ears.

The two following rows were ſown with the ſame wheat, ſmeared in the ſame manner, and was limed only after the ordinary manner.

In theſe rows about a tenth part of the ears were found to be burnt, and there were alſo five ſmutty ears.

The wheat ſown on the three next rows was alſo ſmeared with the duſt of burnt grain, but previous to the ſowing it was waſhed and ſteeped in the Lixivium prepared in the manner preſcribed by M. Tillet.

Not a ſingle burnt ear was found in theſe rows, for they were all ſound, a few ſmutty ears excepted.

The three laſt rows were ſown with ſound wheat, which was not ſmeared with the duſt, but previous to the ſowing it was waſhed and ſteeped in the Lixivium, and before the ſeed was covered the duſt of burnt grain was ſown over it.

Above half the ears were burnt, and there were alſo ſeveral ſmutty ears.

EIGHTH PLOT, *in four Experiments, ſown the ſeventh day of October, the wind in the ſouth, on the laſt day but one of the Full-Moon.*

The ſeed was the ſame as that uſed in the ſecond plot.

The three firſt rows were ſown with ſound wheat; it was not ſmeared with any duſt, and was ſown without being either waſhed or limed.

There were here no burnt ears, and only three that were ſmutty.

The wheat ſown on the three next rows was alſo ſound; it was not ſmeared with duſt, neither was it waſhed before ſowing, but it was limed in the ordinary way.

There was not in theſe rows a ſingle burnt ear, all of them being good, ſound, and healthy.

The three following rows were ſown with the ſame ſound corn, not ſmeared; it was not waſhed previous to the ſowing, but it was ſteeped in the Lixivium after quick lime had been diſſolved in it.

The ears of theſe three rows were all ſound, except a few that were ſmutty.

The wheat ſown on the three laſt rows was very ſound, neither was it ſmeared with any duſt, but previous to the ſowing it was waſhed and ſteeped in the Lixivium according to M. Tillet's inſtructions.

Not a ſingle burnt ear was found, all being ſound and healthy.

NINTH PLOT, *in four Experiments, ſown the ſeventh day of October, the wind in the ſouth, on the laſt day but one of the Full-Moon.*

The ſeed was the ſame as that uſed on the third plot.

The ſeed uſed on the three firſt rows was ſound; it was not ſmeared with any ſort of duſt; it was ſown without being either waſhed or limed, and before it was covered, pidgeon's dung was ſown over it.

There was not a ſingle burnt ear; four of the ears were ſmutty.

The three next rows were alſo ſown with ſound wheat, not ſmeared; previous to the ſowing, it was limed in the cuſtomary way, and before it was covered ſome pidgeon's dung was ſown over it.

Two burnt ears were found here, and a few that were ſmutty.

The wheat ſown on the three following rows was very ſound, it was not ſmeared; it was ſteeped in the Lixivium, and before it was covered pidgeon's dung was ſown over it.

Not a ſingle burnt ear was found, all of them being ſound and healthy.

The ſeed uſed on the three laſt rows was alſo very ſound wheat; previous to the ſowing it as waſhed and ſteeped in the Lixivium, and before it was covered pidgeon's dung was alſo ſown over it.

All the ears were ſound and healthy, except two that were ſmutty.

TENTH PLOT, *in four Experiments, ſown the ſeventh day of October, the wind ſouth, on the laſt day but one of the Full Moon.*

The ſeed was the ſame as that of the fourth plot.

The three firſt rows were ſown with ſound wheat, not ſmeared with any duſt; it was ſown without being either waſhed or limed, and before the ſeed was covered, ſome ſheep's dung was ſown over it.

There were ſome burnt ears here, and ſome that were ſmutty.

The wheat ſown on the three next rows was ſound, and was not ſmeared with the infecting duſt; previous to the ſowing it was limed in the ordinary way, and before the ſeed was covered, ſheep's dung was ſcattered over it.

Not a ſingle burnt ear was found, all being ſound and healthy.

The three following rows were ſown with the ſame ſound wheat at thoſe laſt mentioned, previous to the ſowing, the ſeed was ſteeped in the Lixivium, and before it was covered, ſome ſheep's dung was ſown over it.

All the ears were ſound and healthy, except a few which were ſmutty.

The ſeed of the three laſt rows was ſound wheat, it was not ſmeared with the infecting duſt of burnt wheat; previous to the ſowing, it was waſhed and ſteeped in the Lixivium prepared according to M. Tillet's directions, and before it was covered ſome ſheep's dung was ſown over it.

There was not in theſe three rows a ſingle burnt ear.

ELEVENTH PLOT, *in ſix Experiments, ſown the ſeventh day of October, the wind ſouth, laſt day but one of the Full Moon.*

The ſeed was of the ſame kind as the fifth plot.

The two firſt rows were ſown with ſound wheat, but it was ſmeared with ſome duſt ſwept up in a wheat granary, and was ſown without being either waſhed or limed.

There were in theſe rows ſeven ears of burnt wheat, and five ſmutty ears.

The ſeed of the two following rows was alſo ſmeared with the wheat granary duſt, and previous to the ſowing was limed in the ordinary method only.

There were found here two burnt ears, and four ſmutty ears.

The two next rows were ſown with wheat ſmeared alſo, with the above-mentioned duſt, but previous to the ſowing the ſeed was waſhed and ſteeped in common water, without being any otherways prepared than having ſome quick lime diſſolved in the laſt water.

Not a ſingle burnt or ſmutty ear was found in theſe rows.

The wheat ſown in the two following rows was ſound; but it was ſmeared with duſt gathered up in an oat granary, and was ſown without being either waſhed or limed.

Theſe were no burnt ears, and only two ſmutty ears.

The two next rows were ſown with ſound wheat, but ſmeared with the oat granary duſt, and previous to the ſowing, it was only limed in the ordinary way.

Not a ſingle burnt ear was met with, and but a few ſmutty ears.

The ſeed ſown on the two laſt rows was alſo ſmeared with the ſame oat granary duſt; but previous to the ſowing, it was waſhed and limed in common water.

There were no burnt ears, and but a few that were ſmutty.

TWELFTH PLOT, *in four Experiments, ſown the ſeventh day of October, the wind ſouth, the laſt day but one of the Full Moon.*

The ſeed was the ſame as that of the firſt plot.

The wheat ſown on the three firſt rows was ſound; but it was ſmeared with the duſt of burnt wheat, and was ſown without being either waſhed or limed.

At leaſt one third part of the ears was burnt, and there were beſides ſeveral ſmutty ears.

The three following rows were alſo ſown with ſound wheat, but ſmeared with the contagious duſt; and before the ſeed was ſown it was limed in the ordinary method, yet without previouſly waſhing.

About an eighth part of the ears was burnt, and there were five ſmutty ears.

Sound wheat, but ſmeared with the infecting duſt, was alſo ſown on the three next rows; the ſeed was however ſteeped in the Lixivium, recommended by M. Tillet.

Not a ſingle ear was either burnt or ſmutty.

The wheat ſown on the three laſt rows was very ſound, and was not ſmeared with the contagious duſt; previous to the ſowing the ſeed was waſhed, and ſteeped in the Lixivium; but before it was covered the duſt of burnt grain was ſown over it.

About half the ears were burnt; and there were alſo ſeveral ſmutty ears.

THIRTEENTH PLOT, *in three Experiments, ſown the ſeventh day of October, the wind ſouth, the laſt day but one of the Full Moon.*

The ſeed of the four firſt rows was ſound wheat taken from the barn; but it was ſmeared with the contagious duſt of burnt grain, and was ſown without being either waſhed or limed.

At leaſt two thirds of the ears were burnt; and there were alſo ſeveral ſmutty ears.

The four following rows were alſo ſown with ſound wheat, ſmeared like the ſeed of the four laſt mentioned rows; but previous to the ſowing it was limed in the ordinary way without being firſt waſhed.

At leaſt a tenth part of the corn was burnt; and there were alſo eight ſmutty ears.

The wheat ſown on the four laſt rows was ſound; but it was ſmeared with the contagius duſt, and previous to the ſowing, it was waſhed and ſteeped in common water; no otherwiſe prepared, than by having quick lime diſſolved in it.

Not a ſingle burnt ear was found in theſe rows. There were ſix ſmutty ears.

FOURTEENTH POLT, *in three Experiments, ſown the ſeventh day of October, the wind ſouth, the laſt day but one of the Full Moon.*

The ſeed was ordered like that uſed on the thirteenth plot.

The four firſt rows were ſown with ſound wheat; but it was ſmeared with contagious duſt, and was ſown without being either waſhed or limed.

At leaſt two thirds of the ears were burnt, beſides ſeveral that were ſmutty.

The four following rows were ſown and managed in the ſame manner as thoſe of the ſecond experiment, in the thirteenth plot.

At leaſt a tenth part of the ears were burnt; and there were alſo ſeveral ſmutty ears.

The four laſt rows were in like manner ſmeared with the contagious duſt. Before the ſeed was ſown, it was waſhed and ſteeped in common water without any preparation, ſave that a little quick lime was diſſolved in the laſt water.

There was not a ſingle burnt ear found, but there were ſome ſmutty ears.

FIFTEENTH PLOT, *in four Experiments, ſown the 17th Day of October, the Wind North, the firſt Day of the firſt Quarter of the Moon.*

The ſeed was ordered like that uſed in the firſt Plot.

The wheat ſown on the three firſt rows was ſmeared with the duſt of burnt wheat, and was ſown without being either waſhed or limed.

About two thirds of the ears were burnt, beſides there being ſeveral ſmutty ears.

The ſeed of the three following rows was ſmeared with the ſame contagious duſt, and previous to the ſowing it, only limed in the ordinary way.

At leaſt a tenth part of the ears was burnt, and there were ſeveral ſmutty ears.

In the three next rows the ſeed was alſo in like manner ſmeared, but previous to the ſowing it was waſhed and ſteeped in the Lixivium, prepared according to M. Tillet's directions.

There was not a ſingle burnt ear, but there were a few ſmutty ears.

The wheat ſown on the three laſt rows was very ſound, it was not ſmeared with any duſt, it was waſhed and ſteeped in the Lixivium, and previous to its being covered, the contagious duſt of burnt wheat was ſown over it.

Above half the ears were burnt, and there were alſo ſeveral ſmutty ears.

SIXTEENTH PLOT, *in four Experiments, ſown the 17th Day of October, the Wind North, the firſt Day of the Moon's firſt Quarter.*

The ſeed was managed like that of the ſecond Plot.

The three firſt rows were ſown with ſound wheat, it was not ſmeared with any duſt, and was ſown without being either waſhed or limed.

Not a ſingle ear was burnt; a few were ſmutty.

The ſeed of the three following rows was alſo ſound, and not ſmeared; previous to the ſowing it was limed in the ordinary method.

There were neither burnt nor ſmutty ears found in theſe rows.

The wheat ſown on the three next rows was not ſmeared, it was very ſound; and previous to the ſowing it was ſteeped in the Lixivium, but was not waſhed.

There were no burnt ears found, and only two that were ſmutty.

The ſeed of the three laſt rows was alſo very ſound, neither was it ſmeared; and previous to the ſowing, it was waſhed and ſteeped in the Lixivium, in the manner preſcribed by M. Tillet.

All the ears were ſound and good, except a few that were ſmutty.

SEVENTEENTH PLOT, *in four Experiments, ſown the 17th Day of October, the Wind in the North, the firſt Day of the Moon's firſt Quarter.*

The wheat ſown on the three firſt rows was very ſound, it was not ſmeared with any duſt, was ſown without being either waſhed or limed; but before it was covered, pigeon's dung was ſown over it.

There were two burnt ears, and four that were ſmutty.

The three following rows were alſo ſown with ſound wheat, not ſmeared; previous to the ſowing, it was limed in the ordinary way, and before it was covered, pigeons dung was ſown over it.

There were no burnt ears found, but a few of the ears were ſmutty.

The ſame ſound wheat above mentioned was ſown on the three next rows, it was not ſmeared with any duſt; previous to the ſowing it was ſteeped in the Lixivium, and before the ſeed was covered, pigeon's dung was ſown over it.

There was neither a burnt nor ſmutty ear in theſe rows.

The wheat ſown on the three laſt rows was ſound and good; previous to the ſowing it was waſhed and ſteeped in the Lixivium, and before it was covered, pigeon's dung was ſown over it.

The ears were all ſound, except a few that were ſmutty.

EIGHTEENTH PLOT, *in four Experiments, ſown the 17th Day of October, the Wind North, and the Moon being in the firſt Day of its firſt Quarter.*

The ſeed was ordered like that uſed in the fourth Plot.

The three firſt rows were ſown with ſound wheat, not ſmeared with any duſt, and the ſeed was ſown without being either waſhed or limed; but, before it was covered, ſome ſheep's dung was ſown over it.

There were four burnt ears, and ſix that were ſmutty.

The wheat ſown on the three following rows was ſound and good, it was not ſmeared with any duſt, but previous to the ſowing it was limed in the ordinary way, without being waſhed; and, before the ſeed was covered, ſheep's dung was ſown over it.

There was not in theſe rows a ſingle burnt ear, but four of the ears were ſmutty.

The ſeed uſed on the three next rows was ſound and good wheat, it was not ſmeared with duſt; previous to the ſowing it was ſteeped in the Lixivium, and before it was covered, ſheep's dung was ſown over it.

There were no burnt ears, but a few were ſmutty.

The three laſt rows were ſown with good wheat, not ſmeared; previous to the ſowing it was waſhed and ſteeped in the Lixivium, according to M. Tillet's directions, and before the ſeed was covered ſheep's dung was ſown over it.

The ears were all healthy, except a few that were ſmutty.

NINETEENTH PLOT, *in ſix Experiments, ſown the 17th Day of October, the Wind in the North, on the firſt Day of the Moon's firſt Quarter.*

The ſeed was managed the ſame as that of the fifth plot.

The wheat ſown on the two firſt rows was ſound and healthy, but it was ſmeared with ſome duſt ſwept up in a wheat granary, and was ſown without being either limed or waſhed.

There were found in theſe rows four burnt ears and three that were ſmutty.

The ſeed of the two next rows was alſo ſound, but it was in like manner ſmeared with the wheat granary duſt, and previous to the ſowing was ſimply limed in the ordinary method.

There were two burnt ears, and five that were ſmutty.

The two following rows were ſown with the ſame ſound wheat, but ſmeared with the wheat granary duſt, and previous to the ſowing, it was waſhed and ſteeped in common water, no otherwiſe prepared than by having ſome quick lime diſſolved in it.

There was not a ſingle burnt ear, but there were ſeveral that were ſmutty.

The ſeed ſown on the two next rows was ſound, but ſmeared with duſt ſwept up in an oat granary, and was ſown without being either waſhed or limed.

No burnt ears were found, but there were five ſmutty ears.

The two following rows were, like the reſt, ſown with ſound wheat, ſmeared alſo with oat granary duſt, it was not waſhed previous to the ſowing, but was limed in the ordinary way.

There were three burnt ears, and a few that were ſmutty.

The wheat ſown on the two laſt rows was ſound and healthy, but it was in like manner ſmeared with oat granery duſt, and previous to the ſowing it was waſhed and ſteeped in common water, in which ſome quick lime had been diſſolved.

There were no burnt ears found, and only three ſmutty ears.

TWENTIETH PLOT, *in four Experiments, ſown the 17th Day of October, the Wind North, on the firſt Day of the firſt Quarter of the Moon.*

The ſeed was prepared in the ſame manner as was that of the firſt plot.

The ſeed ſown on the three firſt rows was ſmeared with the contagious duſt of burnt wheat, and was put into the ground without being either waſhed or limed.

At leaſt two thirds of the ears were found to be burnt, there were alſo ſeveral ſmutty ears.

The wheat ſown on the three following rows was in like manner ſmeared, but previous to the ſowing it was limed in the ordinary way, but not waſhed.

Near half the ears were burnt, and four of them were ſmutty.

The three next rows were ſown with wheat, ſmeared in the ſame manner; and previous to the ſowing it was waſhed and ſteeped in the lixivium, according to M. Tillet's directions,

All the ears were ſound, healthy, and good.

The wheat ſown on the three laſt rows was very ſound and healthy, it was not ſmeared with any duſt; previous to the ſowing, it was waſhed and ſteeped in the lixivium, according to M. Tillet's inſtructions, and before the ſeed was covered, the duſt of ſome burnt wheat was ſown over it.

Above half the ears were burnt, and ſeveral were ſmutty.

TWENTY-FIRST PLOT, *in three Experiments.*

The ſeed was prepared like that ſown in the thirteenth and fourteenth plots.

The ſeed ſown on the four firſt rows was ſound; but previous to the ſowing it was ſmeared with the duſt of burnt wheat, and was put into the ground without being either waſhed or limed.

At leaſt two thirds of the ears were burnt, and there were alſo ſeveral ſmutty ears.

The four following rows were alſo ſown with wheat ſmeared in the ſame manner; but previous to the ſowing it was limed in the ordinary way, without being waſhed.

About half the ears were burnt, and there were alſo ſeveral ſmutty ears.

The ſame ſmeared wheat was ſown on the four laſt rows, but previous to the ſowing it was waſhed and ſteeped in common water, without any other preparation than its having quick lime diſſolved in it.

All the ears were good and very healthy, except a few that were ſmutty.

Twenty-second Plot, *in three Experiments, ſown the 17th Day of October, the Wind in the North, on the firſt Day of the Moon's firſt Quarter.*

The wheat was the ſame as that uſed for the ſeed of the twenty-firſt Plot.

The four firſt rows were ſown with ſound ſeed; before it was ſown, it was ſmeared with the duſt of burnt wheat, and was put into the ground without being either waſhed or limed.

About two thirds of the ears were burnt, and ſeveral were ſmutty.

The wheat ſown on the four next rows was alſo in like manner ſmeared, but previous to the ſowing it was limed in the ordinary way without being waſhed.

Near half the ears were burnt, and ſeveral were ſmutty.

The four laſt rows were alſo ſown with ſmeared wheat, but previous to the ſowing it was waſhed and ſteeped in common water, in which quick lime had been diſſolved; this water had no other preparation whatever.

All the ears were good, very healthy and ſound.

Proofs reſpecting the efficient Cauſe of the Evil.

We find by the above experiments, that no poſition of the winds, no phaſes of the moon, occaſioned the leaſt difference in theſe trials. The wheat which was ſmeared with the contagious duſt, and ſown without any preparation, was infected nearly in the ſame degree, and that which was waſhed previous to the ſowing, though it was ſmeared with the ſame duſt, produced a ſound grain in return.

We alſo find, that the ſeed which had pigeons or ſheeps dung mixed with it, was not any ways detrimented by ſuch mixture. It is not therefore either the wind, the moon, pigeons dung, or ſheeps dung, which occaſions our having burnt wheat; this evil is to be attributed to nothing but the duſt of the burnt wheat, which ſticks to the ſeed, and occaſions more or leſs damage in proportion to the quantity there is of it; from all which it follows, that to prevent this evil we need only cleanſe the ſeed well.

It is enough for plain farmers to know in general whence proceeds the evil, and to have a remedy confirmed by experience pointed out to them. Let us leave it to naturaliſts to explore the original cauſes, and diſcover them in learned diſſertations. I propoſe for their conſideration only one ſingle fact, which may be eſteemed a phænomenon.

A grain of wheat forms in the earth a pretty large fibrous root, whence proceed ſeveral ears; of theſe frequently but one, two, or three at moſt are burnt, very ſeldom all of them; ſometimes the corns in the ſame ear are entirely burnt and infected on one ſide and quite ſound on the other; at other times they are even intermixed in the ſame ear, that is to ſay, on the ſide of one ſound and healthy kernel there will be another that is burnt.

In the year 1759 I cauſed ſeveral of theſe ears, which were in part burnt, to be gathered for me; I carefully took out all the healthy corns, and in 1759 ſowed them without waſhing; they produced pure, ſound, untainted wheat.

This obſervation is worthy the attention of naturaliſts; for my part I ſtick to ſuch experimental enquiries as may be of uſe to farmers.

A Method of preſerving Wheat from being burnt.

As the reiterated experiments which have been made prove beyond a doubt, that the duſt of the burnt grain is the ſole cauſe of the evil, and that it infallibly communicated it, we muſt neceſſarily judge it eſſential that the ſeed ſhould be thoroughly cleanſed of this duſt.

The hand-ſeives and the winnowing-ſcreens which farmers ſucceſſively uſe, are not ſufficient to anſwer this purpoſe of thoroughly cleanſing the ſeed wheat; the duſt which is contained in burnt wheat is unctuous, and ſticks to the ſeed ſo cloſe, that the moſt violent motion cannot entirely detach it.

This fact being well known to M. Tillet, ſet him upon diſcovering ſome method of getting rid of this glutinous ſubſtance, and for that purpoſe he thought that the lixivium, for the making of which he has given a receipt, was requiſite. It indeed ſucceeded, the repeated trials he made, thoſe which I made laſt year, and continued the preſent year, ſufficiently prove this.

Being ſenſible, however, that the trouble and ſmall expences which attend this preparation of the ſeed, would hinder common farmers from adopting the practice, I was willing laſt year to try whether ſimply waſhing the ſeed would not be ſufficient. I have this year made the experiment more at large, and I conſtantly found that plain water had the ſame effect as the lixivium. I have alſo learned, that, ſeveral years ago, one of the principal farmers in the diſtrict of Vexin, having a conſiderable quantity of burnt grain in all his harveſt, bethought himſelf of waſhing all his ſeed before he limed it, and the following crop was quite healthy and ſound; for theſe reaſons I am reſolved to continue the practice of this way of preparing the ſeed, it is ſimple, coſts nothing, and every farmer may, with the greateſt eaſe to himſelf imaginable, adopt it.

A ſimple and eaſy Method of cleanſing Seed Wheat from the Duſt of burnt Grain.

You muſt procure two barrels, with one of the heads of each taken out; in one of them common water is to be put, ſuch as may happen to be at hand, and in the other ſome lime is to be ſlaked with boiling water in the uſual way.

There muſt be one or two baſkets, not made too cloſe in the wicker, the handles of which muſt be at the top. Theſe baſkets muſt be of ſuch a ſize as eaſily to go into the barrels, and hold about three pecks of wheat.

About a peck and a half of wheat is put into one of theſe baſkets, which is then together with the wheat plunged into the barrel of plain water; the wheat muſt be well ſtirred with the hand, or a ſmall ſhovel, the baſket being at the ſame time ſucceſſively raiſed and plunged in the water, which muſt be repeated three or four times; by this operation the wheat is entirely cleanſed of the duſt, which ſwimming on the top of the water, is taken off with a ſkimmer, and when the water appears to be blackened with the duſt, it is to be thrown away, and freſh water put into the barrel.

The wheat in the baſket being in this manner well ſtirred, and entirely cleanſed, the baſket is hung up to drain, after which it is plunged into the barrel in which the lime had been ſlaked; but, before it is put in, the water ſhould be well ſtirred at the bottom, becauſe the lime eaſily and ſpeedily precipitates itſelf; without this precaution the wheat would not imbibe enough of it.

The baſket is to be plunged two or three times in the limed water, after which it is left two or three minutes to drain; and the wheat being thus waſhed and limed, is put into a corner of the granary, where it ſpeedily dries, and is fit for ſowing the next day. If, however, it ſhould be neceſſary to leave it ſeveral days without uſing it, to ſtir it with a ſhovel may not be amiſs for fear of accidents.

Obſervations.

This method of preparing the ſeed is neither expenſive, tedious, nor difficult: I prepared laſt year in this manner fifteen comb of ſeed wheat; with three beſides myſelf, we were only four hours waſhing and liming this quantity: it is true I had three baſkets, one of which was draining whilſt we were uſing the two others, and this in ſome meaſure forwarded the work. I ſowed this wheat on a piece of land, and there were ſcarcely any burnt ears in the crop.

The few ears which were burnt in this crop, produced from waſhed ſeed, proceeded from my neglecting at firſt to take off the black duſt, which ſwam on the water, with a ſkimmer, this I afterwards did.

The burnt ears in this crop were not nearly ſo many in proportion as in my other fields where the ſeed uſed was not waſhed; they were indeed ſo few, as not to be worth ſpeaking of, had I not reſolved to tell the whole truth.

The crop which this field yielded me, is this year to ſupply me with all the ſeed wheat I ſhall want to ſow, in the whole one hundred acres.

I propoſe in like manner to waſh fifteen comb of this crop, which I ſhall ſow apart by itſelf, and the wheat it yields will furniſh me with ſeed wheat for next year.

By continuing this practice for ſeveral years, I am pretty certain I ſhall have no burnt wheat; becauſe the ſeed will be well cleanſed of all impurities.

Suppoſing it ſhould even be neceſſary to continue this practice for ſeveral years, yet is it ſo eaſy and cheap, that no good farmer ought to neglect doing it: but in all probability the evil would, in the ſpace of about three years, be rooted out.

In ſupport of this aſſertion we may mention the following inſtance of a farmer in the ſub-delegation of Andely, who ſays, That having had the good fortune at firſt to uſe clean pure ſeed wheat, which he has not changed for twenty years paſt, he has not had a ſingle ear of burnt wheat, though his neighbours have been frequently troubled with it.

This man farmed for many years ſome land on the borders of the river Seine, where the ſoil is half ſand, and half black mould; and for two years he has been ſettled in the diſtrict of Vexin; yet though he ſowed his land in the uſual way, with any wind, and when the moon was at any age, though he manured with pigeons dung, and conſtantly folds his ſheep, he has always ſound crops of wheat; whence we may conclude, that the whole depends on having clean pure ſeed.

There is alſo ſome room to hope, that waſhing the ſeed will not only preſerve the crop from being burnt, but alſo from the ſmut: I do not yet affirm this; but I have obſerved, that I have much leſs of it in the crop that came from the waſhed ſeed.

Though the quantities of water and lime that are neceſſary for liming ſeed are well known, yet, to remove every doubt, it may not be amiſs to give ſome account of my method of managing in this matter.

I put into one barrel about twenty-five gallons of water, which ſerved to waſh the wheat; in the other barrel I put the like quantity, out of which about ſix gallons were boiled to ſlake the lime, of which there was about ſix pecks. This quantity was ſufficient to lime the fifteen combs of wheat abovementioned.

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ARTICLE XVIII.

An Eſſay on the Culture of Parſneps in the open Field, as Food for Cattle; extracted from ſeveral Letters written by M. LE BRIGANT, *Rector of Plouezoch, in Bretagne.*

PARSNEPS are cultivated as food for cattle in ſeveral parts of the province of Bretagne, but as this uſeful practice is not yet ſufficiently extended, it may not be improper to treat in this place, of their culture in the open field.

For this purpoſe, we cannot have a better guide than M. Le Brigant, who has taken the trouble of writing ſeveral letters to us on the ſubject, with which experience has made him very converſant.

Parſneps ſhould be ſown on land which has been dunged the preceding year, and they ſucceed particularly well after barley. The land ſhould be deep plowed, and brought into good tilth.

Whilſt the plow is at work, there ſhould be a number of men provided with ſpades or ſhovels, whoſe buſineſs it is to clear the earth from the bottom of the furrow, and caſt it on the ridge the plow has turned.

The whole field is to be thrown into lands ten or twelve feet wide, and between every two lands a trench ſhould be dug, the workmen throwing the earth that comes out of it on the lands on each ſide.

If any ſmall clods are ſtill remaining, they are to be broke with a rake, and the whole ſurface laid as level as poſſible, excepting that the lands are to have an eaſy ſlope on each ſide, towards the trenches.

The earlieſt time of ſowing the ſeed ſhould be the latter end of February; and the lateſt, the end of March.

The ſeed is covered by briſkly raking the land.

It is cuſtomary to ſow with them, at the ſame time, Windſor beans; and to plant cabbages on the edges of the lands.

The Parſneps muſt by all means be ſown very thin, and if in ſome ſpots they ſhould come up too thick, a part of them muſt be drawn.

As ſoon as the weeds begin to make their appearance, they muſt be carefully hoed and weeded; which work ſhould be more than once repeated.

The Parſneps may be taken up the end of October, but it is much better to wait till the end of November. They are taken up either with a ſhovel or a ſpade.

When they are all out of the ground, they are cloſely piled in a dry place, in order to their being kept a long time.

Parſneps are very uſeful to feed, and even fatten all ſorts of cattle. Horſes, oxen, cows, and hogs, are all equally fond of this nouriſhing root.

The Parſneps are at firſt given to them raw, either cut in ſlices, or ſlit their whole length into quarters.

As ſoon as ever the cattle ſeem to diſreliſh them, the Parſneps muſt be cut into ſlices, and put into a chauldron or copper, in which they are to be preſſed down as cloſe as poſſible.

When this is done, ſome water is poured into the veſſel, to fill up the cavities, and the whole is boiled.

In this ſtate the cattle will eat them with aſtoniſhing greedineſs, and are ſure no more to take a diſreliſh to them.

The hogs in Bretagne have no other food in the winter ſeaſon; and when fodder is ſcarce, the cows there eat nothing bu tParſneps.

With reſpect to horſes, ſome people ſay Parſnips make them ſluggiſh, and withal ſo nice, that they will rather ſtarve than afterwards eat any other food. It it alſo aſſerted, that they hurt the eyes of horſes, and make their legs ſwell.

From the reſult of M. Le Brigant's experience we find, that a field ſown with Parſneps yields three times as much profit, as the ſame field would have yielded had it been ſown with wheat; yet wheat one year with another, in the diſtrict where this gentleman lives, yields a return of nine for one.

We muſt alſo obſerve, that the field produces beſides, the ſame year, a crop of cabbages, and another of Windſor beans; and that the land is in excellent order to bear, the enſuing year, a crop of wheat, or even of flax.

Such conſiderable advantages would induce us generally to recommend the culture of Parſneps, but for an obſervation M. le Brigant makes, on the nature of the ſoil in his pariſh.

He ſays, they have very little clay there, the ſoil being neither ſtiff nor moiſt, but ſtoney and light; and that the farther you go from the ſea, the leſs proper the land is for Parſneps.

It would be of univerſal advantage, were ſome careful experiments made, to try whether Parſneps might not to profit be raiſed on a ſtiff loam.

It were to be wiſhed, that this root was equally well adapted to thrive in every ſoil, as it ſupplies all ſorts of cattle with plenty of very wholeſome food during the winter months.

This, joined to the artificial graſſes, which yield plenty of green fodder by the latter end of April, or, at fartheſt, by the beginning of May, would ſerve to maintain numerous herds of cattle through the whole year.

Experience continually convinces us, that the farmers ſuffer great loſſes amongſt their cattle, for want of fodder, when a dry ſpring happens to hinder the natural graſs from ſpringing. They are then obliged often to ſell at a low price the cattle which they are no longer able to feed. This is a fatal injury to their crops, as the quantity of dung muſt of neceſſity be decreaſed.

For theſe reaſons, we cannot be too much attentive to ſowing of artificial graſſes, and raiſing ſuch crops as will ſupply our cattle with plenty of food during the winter ſeaſon.

To have numerous herds of cattle is certainly of great benefit to every kingdom; and indeed, if we would have large crops of corn, they are abſolutely neceſſary.

Take care of your cattle, and agriculture will be ſure to flouriſh in all its branches.

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ARTICLE XIX.

The Deſcription of a Siberian Tree, bearing a kind of Peas, and which is very proper to be recommended for Cultivation in the Northern Parts of Scotland. Written by M. DE GRAFFENREID, *Lord of Worb in Switzerland, and Member of the Œconomical Society at Berne.*

THIS TREE is known by the following names.

Robinia pedumentis ſimpliciſſimis, foliis abruptis pinnatis. Lin. Sp. et Gen. Plantar.

Aſphalatus, Aman, Ruthen. 210. *n.* 285.

Caragana Siberica. Ray. Hort. Lugd. Bat. 537.

The leaves of this ſpecies of Robinia are conjugated, and compoſed of a number of ſmall ſingle folioles, of an oval figure, and ranged by pairs on one common ſtalk.

The flowers are legumenous, and are cluſtered on a filament, a filament. Every flower conſiſts of a ſmall bell-ſhaped petal, cut into four ſegments at the edge, the upper part being rather the wideſt. The keel is ſmall, open and rounded. The wings are large, oval, and a little raiſed. Within are ten ſtamina united at the baſe, curved toward the top, and rounded at the ſummit. In the midſt of a ſheath, formed by the filaments of the ſtamina, the piſtil is perceivable, conſiſting of an oval germen, terminated by a kind of button. This germen becomes afterwards an oblong flattiſh curved pod, containing four or five ſeeds, of a ſize and ſhape irregular and unequal; yet in both reſpects ſomewhat reſembling a lentil.

This Tree grows naturally in the ſevere climates of Northern Aſia, in a ſandy ſoil mixed with black light earth.

It is particularly found on the banks of great rivers as the Oby, the Jeniſia, *&c.*

It is very rarely met with in the inhabited parts of the country, becauſe cattle are very fond of its leaves, and hogs of its roots; and it is ſo hardy, that the ſevereſt winter does not affect it.

The celebrated botaniſt Gmelin found it the neighbourhood of Tobolſk, buried under fifteen feet of ſnow and ice, yet had it not ſuffered the leaſt damage.

Its culture conſiſts in being planted or ſowed, in a lightiſh ſandy ſoil, which muſt on no account have been lately manured.

It thrives beſt near a river, or on the edge of a brook or ſpring; but preſently dies if planted in a marſhy ſpot, where the water ſtagnates. If it is planted on a rich ſoil, well tilled, it will grow to the height of twenty feet, and in a very few years will be as big as a common birch tree.

In a very bad ſoil this Tree degenerates, and becomes a mere ſhrub: the leaves grow hard, and their fine bright green colour is changed to a dull deep green.

The Tonguſian Tartars, and the inhabitants of the northern parts of Siberia, are very fond of the fruit of this tree, it being almoſt the only ſort of pulſe they eat.

M. Strahlemberg, author of a well-eſteemed deſcription of Siberia, aſſures us, that this fruit is tolerably good food, and very nouriſhing. Theſe peas are firſt infuſed in boiling water, to take off a certain acrid taſte they have, and are afterwards dreſſed like common peas, or Windſor beans; and being ground into meal, pretty good cakes are made of them.

The leaves and tender ſhoots of this tree make excellent fodder for ſeveral ſorts of cattle. The roots being ſweet and ſucculent, are very well adapted to fattening hogs; and the fruit is greedily eaten by all ſorts of poultry. After ſeveral experiments ſomewhat ſimilar to the methods uſed with Anil and Indigo, a fine blue colour was procured from it's leaves.

The ſmaller kind of this tree *Robinia*, (Lin. Sp. et Gen. Plant. n. 5. or *Aſphalatus minor*,) ſeems ſtill better adapted to anſwer this purpoſe. The ſtriking elegance of its foliage, joined to the pleaſing yellow colour of it's beautiful flowers, ſhould, one would imagine, bring it into requeſt for forming noſegays, or for ſpeedily making an elegant hedge.

Beſides the qualities above recited, it poſſeſſes the uncommon advantage of growing exceedingly quick, and of being eaſily tranſplanted.

I am acquainted with but few trees, which, like this, will within four or five years after it is ſown, bear fruit in abundance; and which, in the ſame ſpace of time, will grow fifteen feet in height, and five or ſix feet in circumference.

After all that has been ſaid with reſpect to this uſeful tree, the culture of it cannot ſurely be enough recommended, particularly in cold mountainous countries.

There are large plantations of it now in Sweden, Norway, Lapland, and Iceland.

The celebrated Linnæus aſſures us, that, after the *Pinus fol. quinis*, erroneouſly named the Cedar tree of Siberia, this tree, of all that are to be found in Siberia, is moſt worthy of cultivation.

[The Tranſlator is of opinion, that it may ſerve to illuſtrate this ſubject, if he lays before the reader the ſentiments of the very accurate Mr. Miller, with reſpect to this plant, ſo much recommended in the above eſſay.

In his Gardener's Dictionary, edition 1759, under the article Robinia, he informs us, that the characters of this Genus of Plants are as follow.

"The empalement of the flower is ſmall, of one leaf, and divided into four parts; the three under ſegments being narrow, but the upper one is broad. The flower is of the pea bloom kind; the ſtandard is large, roundiſh, obtuſe, and ſpreads open. The two wings are oval, and have ſhort appendixes which are obtuſe. The keel is roundiſh, compreſſed, obtuſe, and is extended the length of the wings. In the centre are ſituated ten ſtamina, nine of them being joined together, and the other ſtanding ſingle, terminated by roundiſh ſummits. It hath an oblong cylindrical germen, ſupporting a ſlender ſtyle, crowned by a hairy ſtigma; theſe are incloſed by the keel. The germen afterward becomes an oblong compreſſed pod, incloſing kidney-ſhaped ſeeds."

Our author obſerves, that this genus of plants is ranged in the third ſection of Linnæus's ſeventeenth claſs, which includes thoſe plants whoſe flowers have ten ſtamina joined in two bodies; and that Tournefort places it in the third ſection of his twenty-ſecond claſs, which contains the trees and ſhrubs with a butterfly flower, whoſe leaves are, for the moſt part, placed by pairs along the mid-rib.

We find that the plant deſcribed, by the foreign author, is Mr. Miller's tenth ſpecies of the Robinia, namely, *Robinia pedunculis ſimplicibus, foliis quaternatis petiolatis.* Hort. Ups. 212. Robinia, with ſingle foot ſtalks, and leaves growing by fours upon foot ſtalks. This is the *Aſpalathus fruteſcens major latifolius, cortice aureo,* Aur. Ruth. 283. Greater broad leaved ſhubby Aſpalathus, with a golden bark.

It grows, he ſays, naturally in Siberia and Tartary, with a ſhrubby ſtalk eight or ten feet high, ſending out ſeveral branches, which grow erect, and are covered with a ſmooth yellowiſh bark. The leaves have each two pair of oval pointed lobes, which ſtand upon ſhort footſtalks. The flowers are produced upon ſingle footſtalks, which come out at the joints of the branches; they are yellow, and ſhaped like thoſe of the Laburnum (the firſt ſpecies of Miller's Cytiſus) but are ſmaller. Theſe appear in May, and if the plants ſtand in a moiſt ſoil, and ſhady ſituation, their pods will ſucceed the flowers, and the ſeeds will ripen the end of Auguſt.

This ſort is propagated by ſeeds, which ſhould be ſown in a ſhady ſituation in autum, and then the plants will come up the following ſpring; but if the ſeeds are ſown in the ſpring, the plants ſeldom riſe the ſame ſeaſon. When the plants are come up, they will require no other care but to keep them clean from weeds till autumn, when, if the plants have made any progreſs, they ſhould be tranſplanted on a north border, at about ſix inches diſtance, where they may grow two years, and then ſhould be planted where they are to remain, which ſhould be in a cool moiſt ſoil.]

ARTICLE XX.

The Culture of the great red Clover, as practiſed in Bretagne in France, being the Method recommended by M. *le Baron* DE PONTUAL.

CLOVER yields amazing large crops, and requires not as much care in its culture as the other artificial graſſes; it is, beſides, particularly well adapted to ſuch lands as are ſuffered to lay idle for three or four years, after having borne ſeveral ſucceſſive crops of corn.

Theſe years of idleneſs may properly enough be termed years of barrenneſs; yet the peaſants are unfortunately ſo far prejudiced in opinion, as to eſteem them a reſource for feeding their cattle. But this prejudice ſerves only to ſhew, how few natural paſtures there are in the province; and of courſe, how neceſſary it is to cultivate thoſe which are called artificial.

In countries where there is plenty of feed for cattle, green in ſpring, ſummer, and autumn, and dry in the winter, would fallows barely covered with weak, languiſhing, and often dangerons weeds, be eſteemed a reſource? Theſe paſtures, if they can be ſaid to merit that name, are neceſſarily hurtful to cattle.

The leanneſs and want of ſpirit in our cattle, in moſt parts of the province, may, in a great meaſure, be aſcribed to the want of a ſufficient quantity of winter fodder, and the ſcarcity of feed on the fallows in ſummer. They vainly wander in ſearch of a belly-full. Hunger, and the want of better feed, make them eat, indiſcriminately, all the plants they meet with, and of courſe ſome that are very pernicious in their natures.

It would, therefore, certainly be of great benefit to ſubſtitute, inſtead of this ſcanty feed, plants which are vigorous and nouriſhing.

Clover would anſwer this purpoſe effectually, and the culture of it is by no means difficult.

The land muſt be well plowed, and got into fine tilth. The ſeed may be ſown in March, April, May, June, or July. Eight pounds will ſow an acre of land.

On the ſame land, and at the ſame time may be ſown, oats, barley, buck-wheat, or flax; the laſt, however, is to be preferred, becauſe in pulling it, the earth is looſened, and a new mould raiſed about the roots of the clover.

The Clover ſeed ſhould be mixed with double its quantity of ſand or aſhes, as it may by that means be ſown with greater regularity, and there will alſo be a conſiderable ſaving in quantity.

A very light harrow, or a rake, will ſerve to cover the ſeed; if it lay too deep it would not come up at all.

Clover ſhould be cut juſt as it begins to flower, except ſuch as is intended to be ſaved for ſeed, which ſhould be from the ſecond cutting.

This plant will grow in all ſoils, but it thrives beſt in freſh land that is not too moiſt.

It laſts at leaſt three years, and ſometimes five.

It is much more advantageous to ſpend it green than dry. Cattle ſhould be kept out of Clover lays, and the crop will be greatly enlarged if ſome rotten dung is laid on the field in the winter.

When the crops fall off they are broke up by the plough, and the farmer finds his land greatly improved.

Clover is of ſo much the greater advantage to the farmer, as it puts him to no other expence than the purchaſe of the ſeed, which is no great matter.

Clover thrives very well being ſown with oats. M. le Preſident de Montlac ſowed ſome in this manner, in 1758, and had a prodigious crop of oats.

At harveſt the Clover was very thick, and near two feet high.

The manure which the ſeveral crops of corn have left in the land, ſerves to bring the Clover forward. From theſe ſeveral circumſtances it is plainly evident, that for only the coſt of the ſeed the farmer may have a rich paſture, which he may cut at leaſt twice, and frequently three and four times in a year; and even this ſmall expence would be greatly reduced, was Clover as plentifully cultivated in the province as we could wiſh.

M. le Baron de Pontual, who has cultivated large quantities of Clover, and who wrote the above method, 3000 copies of which have been diſtributed, obſerves, that this food is apt to heat cattle, if they have not ſome other fodder given them with it. A Flemiſh farmer taught him a method of remedying this quality of Clover, and, at the ſame time, of making it go much farther.

In Flanders, where a conſiderable quantity of it is cultivated, they ſtack it in alternate layers, ſix or ſeven inches thick, with ſtraw.

The Clover imparts a ſhare of ſmell and taſte to the ſtraw, inſomuch that oxen and horſes will eat either with equal reliſh. By this means the ſtraw becomes of the ſame value with the Clover, and keeps the cattle cool and in good order.

M. de la Chalotais, and M. de Nevel, planted Clover in rows, to ſee if this, like many other plants, might not that way be made to yield a larger crop. The experiment did not ſucceed, yet it might, in ſome ſort, be deemed ſucceſs, to diſcover that Clover, which thrives well ſow it how you will, produces by far the moſt conſiderable crops when it is ſown broad caſt.

ARTICLE XXI.

Obſervations on the culture of Lucerne, as ſown by ſeveral Members of the Society for promoting Agriculture, eſtabliſhed by the States of Bretagne.

CLOVER thrives beſt, and yields the largeſt crops when ſown broad-caſt; but the contrary is found to be the caſe with reſpect to Lucerne.

M. de Chalotais cauſed ſome Lucerne to be ſown broad caſt; that part of it which was not overpowered by the weeds, and killed by unknown cauſes, came up very well, but the greateſt part by far periſhed. Thoſe plants which did come up would have alſo periſhed had they not been taken up and tranſplanted in rows. This method of culture revived them, and they yielded good crops of fodder.

M. de Laurencin, who is a great promoter of agriculture, has communicated to the Society his obſervations on the culture of Lucerne. He ſowed it for ten years together, till at laſt he was almoſt tired, as his plants were continually choaked by the weeds.

About three years ago he made an experiment of ſowing it in rows, far enough one from the other to admit a ſpade. A ſlight digging not much above two inches deep betwixt the rows, with this inſtrument, will, now and then repeated, deſtroy the weeds; and with this ſlight tillage, the Lucerne may be cut four or five times in a year.

But nothing is more deciſive in favour of cultivating Lucerne in rows, than the experiments made in May 1758 by M. de la Chalotais, and M. de Montluc.

The ſeed came up very well, and in proper time;

but it was ſcarcely out of the ground before exceſſive dry hot weather, unaccompanied with dews, ſo frequent at that ſeaſon of the year, ſurprized the young plants and parched them ſo, that they were ſcarcely to be ſeen.

Notwithſtanding this accident, which ſeemed ſo well adapted to deſtroy them, on the firſt rain that fell they made ſurprizing ſhoots.

M. de Montluc ſowed another piece of ground with Lucerne the beginning of June, the weather being more favourable.

At the end of July both the firſt and ſecond ſowings of Lucerne were fit for cutting, being ſtrong, ſucculent, well nouriſhed, and two feet and a half in height.

The plants ſpeedily made a ſecond ſhoot, inſomuch, that, by the end of October, they had got to the height of three feet.

Theſe experiments juſtify M. Duhamel, in ſo ſtrongly recommending the culture of this plant in rows. The great crops he mentions to have had, are ſufficient recommendations of his method of culture; yet it will not be proper to make too haſty a deciſion reſpecting the beſt method of cultivating this plant.

The Lucerne which is cultivated about Paris is all ſown broad caſt. This method being moſt ſimple, and much the eaſieſt comprehended by farmers, ſhould be univerſally recommended, if we could lay down any certain rule for enſuring ſucceſs, though the crops in this way are not ſo large, and much more ſeed is uſed.

It is in vain to attempt introducing amongſt farers the culture of Lucerne, if we do not preſcribe it to them in ſome method they are accuſtomed to. Time and example may bring them to better methods when they ſee the advantages reſulting from the practice of them to others.

To aim at once at perfection, would be effectually diſcouraging all thoſe who never think of riſing above mediocrity.

To cultivate Lucerne in rows, the land muſt be well prepared, and deep plowed.

The ſeed ſhould be ſown in rows, diſtant three feet one from the other; a light plow is from time to time to be paſſed between the rows.

This culture deſtroys the weeds as faſt as they make their appearance, prevents the earth in the intervals from hardening and binding, and always keeps it in ſuch a looſe ſtate, as, giving a paſſage to to the roots, cauſes the plants to yield prodigious crops.

After the firſt year, a conſiderable part of the plants in the rows is to be taken up, and they ſhould be tranſplanted into a well-prepared field, in rows ſix inches aſunder, [much better twelve inches] and the intervals ſhould be from time to time plowed in the manner above deſcribed.

The farmer who is no able calculator regards all theſe particulars as ſo many ſources of trouble and expence to him; he knows not, nay will not believe if it is told him, that theſe expences do not amount to a fourth or fifth part of the advantages and profit which reſult from them.

To propoſe to him a method ſeemingly ſo expenſive, ſo complicated, and ſo much different from his uſual practice, is enough to terrify him. Therefore, before we recommend this method to farmers it will be neceſſary to repeat the experiment of ſowing it broad caſt in ſtrong land. It will be proper to examine whether the failure of ſucceſs in the firſt trials may not be attributed to ſome hidden cauſe, which does not always affect ſuch land.

It will alſo be proper to ſow ſome Lucerne broad caſt in lighter lands, in order to judge by the crops what ſoil is beſt adapted to it.

ARTICLE. XXII.

An Account of an Experiment of ſowing Clover on Rye in the Spring; made by Monſ. TSCHEFFELI, *Vice-preſident of the Œconomical Society at Berne.*

IN the month of April laſt, I cauſed thirty pounds of red dutch Clover ſeed to be ſown on a field, containing about four acres, which was under Rye. Though the ſoil of this field was naturally very good, tolerably deep, and of a moderate ſtrength, yet I found, in the end, that it was more exhauſted than I had imagined.

Beſides, a fortnight's dry weather, which immediately ſucceeded the ſowing, occaſioned all my labour and expence to be thrown away: but one of my neighbours was much more fortunate.

This perſon, by my advice, made the ſame experiment on two acres of common field land, which had been well manured; and in the beginning of September, he made hay enough, to reimburſe him all the expences he had been at; and next year he will probably have a much larger crop.

My neighbour had two advantages, of which I was deſtitute; his land being in better heart, and a fine rain falling as ſoon as he had ſpread his ſeed: On theſe two circumſtances depends the ſucceſs of Clover ſown over Rye.

ARTICLE XXII.

An Experiment to try whether Lucerne and Dutch Clover will bear tranſplanting: made by the ſame Gentleman.

LAST May I was willing to know whether the above two foreign graſſes would bear tranſplanting: In order to which I cauſed one thouſand plants ſown the preceding ſpring to be taken up.

The roots were cleanſed from the earth, and together with the heads, were ſhortened. The plants were then put into water, and afterwards planted in the ſame kind of ſoil they grew in, but pretty well tilled. Laſtly, they were lightly covered with ſtraw for a fortnight, to defend them from the heat.

Of theſe thouſand plants, four at moſt died: all of them, and particularly the Lucern, made conſiderable ſhoots this ſummer, and according to all appearance they will continue to thrive: It will however, if poſſible, be neceſſary to leſſen the expence of tranſplanting, which at firſt goes on but ſlowly, by diſcovering ſome method in which a woman might remove in a day about 2000 plants. This I think might be done with the help of an inſtrument like a rake, having iron teeth, thick, and long, ſet in parallel to the handle. This is to be preſſed into the ground, by bearing the foot upon the head in which the teeth are fixed. If the plants were to be four inches aſunder, there would be ſix holes, provided the head was two feet in length.

If this could be done, judging by the experience I have had, I ſhould imagine the method of tranſplanting might to great edvantage be adopted. In my opinion, the beſt way would be to plant them in rows, a foot diſtant, and ſix inches aſunder in the rows. I am apt to think, that in this way, an acre of land would yield twice the quantity it would otherwiſe do: beſides, a piece thus planted with Lucerne, would, in the ſecond year produce a full crop, with the greateſt probability of it's preſerving this flouriſhing ſtate for many years.

FOREIGN ESSAYS, &c.

NUMBER III.

ARTICLE XXIV.

An Eſſay on the beſt method of improving old worn-out Paſtures by Plowing. Written by M. Tschiffeli, *Vice Preſident of the Œconomical Society at Berne in Switzerland.*

A Great plenty of fodder for the uſe of cattle, undoubtedly forms the baſis of a profitable huſbandry, in climates ſuch as that we live in, (Switzerland.)

The natural coldneſs of great part of our corn land, and the dryneſs and barrenneſs of much of the reſt, require vaſt quantities of manure. The hardneſs of the ſoil, which is almoſt general, requires alſo a ſtrong team to do the neceſſary plowing work.

How are we to ſupply theſe ſeveral wants without proportionable quantities of fodder? Beſides the Paſtures furniſhing Switzerland with the means of breeding ſuch conſiderable herds of cattle, which are with us ſo capital an article of exportation, we ought to omit no opportunity of improving them; on the contrary, our daily endeavours ſhould tend to make them yield more abundant crops. The larger our crops of this kind are, from the ſame extent of land, the more land ſhall we have left to us for the purpoſes of tillage; and as the quantity of our manure will be in proportion encreaſed, we may expect that our crops of corn will be conſiderably more plentiful.

At preſent they reckon that a good farm ſhould contain at leaſt as many acres of Paſture as of land in tillage; but it is very certain, that few of our farmers are ſo well off. I know ſome farms where the graſs land does not amount to a ſixth part ſo much as the plowed land: yet after all, in the ſtate in which we find the greateſt part of our graſs land, half is not enough, there ſhould be at leaſt two thirds, to furniſh us with dung to manure the plowed land properly.

This may eaſily be made to appear.

Suppoſe I poſſeſs thirty acres of land in Tillage, and thirty acres of Paſture. Of my lands in Tillage ten acres will be fallow, ten more will be under wheat or bere, and the other ten will be ſown with either rye or ſpring corn; this is the conſtant courſe of our common field land, which is ſubject to commonage.

The next ſeed time then I ſhould dung my ten acres of fallow, in order to ſow wheat; for without the help of manure, I cannot expect even a middling crop.

We well know by experience, that ten load of dung, each load containing fifty buſhels, is but an indifferent dreſſing.

If the dung ſhould not be well rotted, it is always neceſſary to increaſe the quantity, but even then it is not ſo good as what is well rotted.

Moderately ſpeaking then, we ſhall have occaſion for one hundred loads of good dung, but will my thirty acres of paſture furniſh me with this quantity?

An acre of common paſture will not, at a medium, generally yield more than a load of hay in a year, unleſs it is from time to time manured, or carefully flooded with good water.

Low meadow lands, it is true, will yield a larger quantity, but then the hay is not ſo nouriſhing, nor will it go ſo far; beſides, the dung it produces is not ſo good.

If then we allow to every load of hay two loads of ſtraw for litter, we ſhall at the moſt receive but three loads of rotten dung in return. Thus, from my thirty acres of paſture I get ninety loads of dung, which I find to be ten loads leſs than I have occaſion for to lay on my fallows, allowing none for my kitchen garden, my hemp and flax grounds, and other crops to which dung is abſolutely neceſſary, and which a farmer cannot do without.

It muſt not appear ſurprizing that in many parts of this country, particularly near the large towns, a ſyſtem of farming has been of late years adopted, in thoſe lands eſpecially which are not ſubjected to the rights of commonage, in which all the arable land is made to bear alternately corn and graſs; care being taken that two thirds of the land be always down in paſture.

In every part where this wiſe method has been adopted, the lands have doubled their crops, and of courſe their value.

I thought it neceſſary to ſay ſo much, for the benefit of ſuch of my countrymen as might not be acquainted with this method.

There are too things which ſhould principally induce a farmer to break up or plow a part of his paſtures; the high price of wheat, which makes its culture more profitable than ordinary, or the paſture's falling off in its produce.

The firſt of theſe cauſes being accidental, and a matter of ſpeculation, I ſhall not in this place enlarge on it.

The ſecond will of courſe be the caſe with all upland paſtures; as to the low meadows, they cannot without draining be plowed; and there are but few paſtures which enjoy the ſingular advantage of being flooded with good water at proper times.

The plants generally met with in our ordinary paſtures, as nearly as I can remember, now the ſeverity of the weather has made them diſappear, are wild Ranunculas, Alchimilla, Daiſies, Craneſbill, Betony, Bugloſs, wild Marjoram, Sorrel, Chervil, Cummin, wild Parſneps, wild Mint, broad and narrow leaved Plantane, wild Burnet, Cowſlip, Yarrow, Shepherd's Pouch, Camomile, Pimpernel, and laſtly all the ſeveral kinds of Cow Graſs and Trefoils.

The beſt of theſe plants are ſuch as are well furniſhed at bottom with ſweet leaves, and have ſtalks which do not grow too hard in drying.

Such are the Trefoils, Alchemilla, narrow leaved Plantane, *&c.* As our Aftermaths conſiſt for the moſt part of theſe ſorts of plants, the larger, hard, and leſs ſucculent plants not abounding ſo much in them; the ſecond crops of our graſs, though much inferior in quantity, are greatly ſuperior in quality to the firſt; which remarkable difference diſtinguiſhes our Aftermaths from thoſe of any other part of Europe.

The plants of a middling quality are thoſe which in haying eaſily loſe their ſmall leaves, ſcarcely any thing but ſtalks being left; ſuch as Craneſbil, Chervil, Cummin, Sorrel, wild Parſnep, and the ſeveral ſorts of Cow Graſs.

The worſt plants are thoſe which ſend forth hard ſtalks, affording very little nouriſhment, ſuch as Chamomile, Bear's Foot, Shepherd's Pouch and Yarrow. If cattle are not very hungry they will not eat theſe in the ſtable.

To theſe plants we may add the broad leaved

Plantane; its broad leaves laying cloſe to the ſurface of the earth, are not only out of the reach of the ſcythe, but they alſo prevent all other plants from growing under them.

I ſcarcely know any greater evil that can infeſt our good paſtures. As ſoon as ever it appears, its progreſs is really every year aſtoniſhing; and there is no other method of deſtroying it, but by putting the plow into the field.

Another enemy to our paſtures, particularly thoſe which lay high and dry, is moſs. It no ſooner begins to get a head but the graſs is in the ſame proportion diminiſhed in quantity. Nothing but the plow, or hot manures, ſuch as turf aſhes, ſoot, urine, and human ordure, can ever remedy it; ſhade is a great friend to its growth.

Suppoſe even that neither the plantane nor moſs infeſts our graſs lands, yet will they in a length of time, by degrees, of themſelves fall off, on account of the prodigious quantity of roots of plants which continually increaſe in them.

In the end theſe roots become ſo interwoven, that they form a cloſe coat or covering to the land, the turf being ſtretched, and ſmooth like the ſkin on a drum; in fact, the field becomes ſo much hidebound, that the earth underneath is abſolutely precluded from receiving any benefit from the air, rains, or even manures.

From this time vegetation languiſhes, and at the end of a few years the fineſt piece of graſs land becomes only a poor lean worn-out paſture, where the wretched cattle are forced to wander from ſpot to ſpot in ſearch of a miſerable pittance.

As ſoon therefore as our graſs lands fall off in their crops, be it from what cauſe it may, we endeavour to remedy it by plowing. This is generally our reſource every ſixth or eighth year; few of our graſs lands will hold out longer without this aſſiſtance.

The firſt thing we do is to examine the nature of the ſoil. If it is but ſhallow, and is at the ſame time light and dry, a ſingle plowing, ſuch as I ſhall juſt now deſcribe, is ſufficient to bring it again into full bearing; but in other caſes of a contrary nature, the operation muſt be repeated the year following.

About the end of September we ſpread on a worn-out Paſture about ten loads of good dung *per acre*, which we turn in, together with the turf, as deep as the ſoil will permit, with the common plow.

Along the furrow we place as many hands as may be neceſſary to break the clods before the next bout of the plow covers them.

In order to do this work as it ſhould be, it will be neceſſary to have ſix or eight people to each plow. Each perſon is provided with a light ſpade, but very ſharp; and if they work as they ought to do, there will very few clods remain bigger than the fiſt.

When this work is done, the field is ſown with Bere, the quantity of ſeed being proportioned to the nature of the ſoil, and the quantity of manure that has been uſed; that is to ſay, the richer the land is, the leſs ſeed it will require.

After the ſeed is well covered with the harrow, the careful and diligent farmer paſſes a heavy roller over the field, but this muſt never be done except the weather is dry, leſt it ſhould knead the land too cloſe.

Rolling is of great ſervice in defending the roots of the bere from the ſeverity of the winter froſts; and it alſo makes the land ſo level, that when it is afterwards laid down to graſs it is much eaſier to mow.

The ſpring following, if it is not propoſed to weed the bere, it will be of great ſervice, if juſt before it begins to branch, a large buſh harrow is drawn over the field. Some may perhaps imagine this will be but of little ſervice, yet by ſcratching the ſurface of the earth, and raiſing a mould, it is certainly of great benefit to the crop, by giving it ſtrength and vigour.

I deny not but that weeding would in many reſpects be of more advantage, but this work being expenſive, few farmers can afford to do it in any extent.

Weeding does not at all leſſen the future crops of graſs, when the field comes to be again laid down. This work being never ſo neatly and exactly done as in a garden, or even hemp ground, the weeders attending only to the larger plants, the deſtruction chiefly falls on the thiſtles of all kinds, the blew bottles, orache, bind weed, poppies, and other traſh of that nature, as hurtful to the graſs if they infeſt it, as to the corn, from which we would baniſh them.

When the bere is harveſted, if it is a light ſhallow earth, the work is done; it is alſo neceſſary to keep all cattle out of the field, and when it is harrowed, the following ſpring with a pair of drags, to kill the large weeds, the farmer will ſoon have the pleaſure of ſeeing the ſurface covered with a beautiful turf, as agreeable to behold as it is uſeful for the food of cattle.

If, on the contrary, the ſoil of the field ſhould be deep and heavy, the ſame operation is in all points to be repeated; obſerving only, if poſſible, that the dung for the ſecond crop of bere is not ſo much rotted as was the firſt. The quantity of graſs ſeeds of all kinds ſtill capable of vegetating, which this dung contains, will not a little contribute to form your turf the following year.

If the farmer, ſome weeks after the bere is off the land, or in the following ſpring, ſhould perceive any ſpots bare, he will do well to ſow there ſome hay ſeeds, which fall in plenty when they ſhake it before they give it to the cattle.

In order to preſerve this field in good condition, I ſhall only make one remark; which is, that it ſhould never be watered or flooded the firſt year, particularly if the ſoil is light, and the field lays on a ſlope. The earth being looſe, and not well ſettled, the roots of the beſt plants would by ſuch watering be laid bare and injured.

It is no eaſy matter to account whence proceeds ſo ſuddenly that immenſe quantity of plants, which we ſee cover our land the ſecond year after it has been managed in this manner. Undoubtedly the fibres of the roots of ſome plants ſtill preſerve life in them, notwithſtanding the field has been ſo often diſturbed. Much ſeed is alſo carried on with the dung. The wind alſo may bear many of the winged ſeeds from the neighbouring lands.

But that which appears to me moſt probable is, that many ſeeds are found under the old turf, which, though they had not room to grow, poſſeſſed the peculiar quality of being preſerved in that ſtate for a number of years without rotting.

The earth being afterwards broke, looſened and mended, I conceive that all thoſe ſeeds which are not buried too deep come up; and that ſuch as fall to the bottom of the furrow, and are covered too deep for the air to affect them, remain in that ſtate unhurt, and wait only for ſome future opportunity of being brought towards the ſurface to vegetate and grow.

It may not be amiſs, before I conclude, to give ſome reaſon why in this method of huſbandry I prefer bere to all other grain.

Dung being very dear with us, it is natural to think we ſhould prefer that crop which will yield us the largeſt return, without damage to our principal view, which is laying the field again down to graſs.

Wheat, though in itſelf a more valuable crop, is not yet ſo proper for our purpoſe. To ſucceed well, it requires at leaſt three or four good plowings in lands that have a ſtrong turf. This would of courſe deprive us of our laſt crops of hay and the aftermath; and there is alſo a great probability that theſe ſucceſſive plowings would be injurious to our future intended paſture. Plowing deſtroys the ſeeds of graſs, therefore they cannot be proper to promote its vegetation.

Oats do not thrive well except on high grounds, without the aſſiſtance of dung they would only impoveriſh the land, which required to be amended; and in land that is well dunged, they run away all to ſtraw.

A crop of rye is not worth above half as much as a crop of bere, and barley is by no means adapted to our intended purpoſe; ſo that after all, I, without the leaſt heſitation aſſert, that bere, of all grains, is the beſt adapted to the improving of old worn-out Paſtures.

ARTICLE XXV.

To the Authors *of the* Foreign Eſſays *on* Agriculture *and* Arts.

Gentlemen,

VARIOUS have been the opinions reſpecting the nouriſhment extracted by plants from the earth; ſome aſſerting that all plants require the ſame food, and that there is only one nutritive juice which equally ſerves for them all, being ſecreted, modified and adapted to the nature of each plant by means of certain organs contained in its ſtructure.

Others, on the contrary, ſay, that every plant requires a particular food, and that when one plant has extracted from the earth all the nouriſhment it requires, and which is adapted to its nature, the ground is not the leſs proper for affording nouriſhment and ſupport to ſome other plant of a different genus.

I do not by any means pretend to judge which of theſe opinions is moſt reconcilable to nature and reaſon, tho' I have been long a practicable huſbandman in one of our North American Plantations: the truth is, theſe are enquiries which do not immediately attract the attention of the farmer, and it is only ſince I have been retired from buſineſs, and ſettled in this Metropolis, that I have at all attended to ſuch reſearches, which, though curious, have yet their uſe.

As you invite Gentlemen to correſpond with you, and ſend you pieces for inſertion, I have taken the liberty of recommending to your notice a piece written on this ſubject by the celebrated Monſ. du Hamel; and ſhall next month, if you approve of it, ſend you a moſt curious piece on the ſame ſubject, written by Mr. Engel of Switzerland. I ſhall not at preſent take up more of your time, except to aſſure you that I am a well-wiſher to your work, and, Gentlemen, your very humble ſervant.

London, March 2, 1765. R. BRENNAN.

An Eſſay on the queſtion Whether the ſeveral Kinds of Plants require the ſame Nouriſhment; by Monſieur DU HAMEL.

TO take this matter in a general ſenſe, it does not ſeem probable that the ſame matter can ſupply ſuch a number of plants, differing one from the other in appearance, in form, ſmell, taſte, and even in their properties, with food: for it is not to be doubted but the internal parts of plants differ much one from the other.

But we muſt not thence conclude that the nutritive juices differ whilſt in the earth, previous to their being modified by the organs of the plants. In reflecting that plants rob one another of nouriſhment, by means of the roots they extend in the earth, we are under a neceſſity of admitting that the firſt nutritive juices are homogeneous.

It might indeed be urged, that as water enters largely into the compoſition of the ſap proper for all plants; and as it is, at leaſt, a vehicle neceſſary to diſſolve the other conſtituent parts of the ſap: this vehicle, neceſſary to all plants, being abſorbed by ſome plants, thoſe remaining, muſt, of courſe, ſuffer, as the other conſtituent parts of the ſap could not any longer be divided and diſſolved as much as was neceſſary, to enable them to enter theſe plants. But ſomething yet more explanatory may be added; if, for inſtance, a Lettuce required any different food from that which ſupplies Endive with nouriſhment, this Lettuce planted with Endive would thrive better than if planted among other Lettuces; however, experience convinces us to the contrary. It is then certain that plants of different kinds rob each other of their food; and it ſeems as if this extended farther than the aqueous vehicle; beſides, it can be made appear, that the ſame juice, imbibed by different plants, aſſumes various qualities. For inſtance, having taken a Lemon of the ſize of a pea, and grafted it by the ſtalk on the branch of an Orange-tree, it there throve, ripened, and ſtill preſerved its quality of a Lemon, without partaking in any thing of the Orange: this inconteſtably proves, that the juices of the Orange-tree received a different modification on entering into the organs of the Lemon. All grafts prove the ſame thing.

Not content with thinking there were different ſaps for the nouriſhment of every plant, ſome would have it, that there were in every ſap particular juices to form every part of the ſame plant, or the ſame fruit. What a difference is there betwixt the fleſh of a Peach, the ſhell of its ſtone, the ſubſtance of its kernel, &c.? It was, therefore, thought neceſſary, that it ſhould have as many particular and diſtinct juices for the nouriſhment of each part.

It ſeems to me very probable, that the organs of plants ſo modify the ſap as to give a different flavor to fruits, and form the different parts of the ſame fruit; for with ever ſo much attention, no traces can be found either of the flavour or the ſmell of a root, in the earth that ſurrounds it; and in chewing the leaves and young branches, there is often perceived a total want of any thing analagous to the flavour, or the ſmell of their juicy and aromatic fruits.

Should any one aſk me how the ſame ſap can ſerve for the formation and nouriſhment of the ſhell of the ſtone, the ſkin of the kernel, and the fleſh of a Peach, I would, in return, aſk the moſt able Anatomiſt, how the chyle, which is the ſap of animals, can form the ſubſtance of the brain, the nerves, the membranes, the fleſh, the bones, the nails, &c. Theſe operations depend on a mechaniſm ſo refined and delicate, that it has eſcaped the reſearches of the moſt celebrated Naturaliſts.

Mariotte imagined, that in plants, this operation was performed in the roots; but by grafts, and many other obſervations, it is fully proved, that the organs capable of giving a modification to the ſap, exiſt in all the parts of plants; and if we ſometimes meet with imperfect Peaches, which taſte of the leaves of the tree, it is moſt natural to attribute it to a depravity of the organs deſtined to give a new preparation of the ſap which was to enter the fruit.

It is true, that particular taſtes are found in fruits, which ſeem to proceed from the earth in which the trees are planted, and which, on that account is called the taſte of the ſoil; but theſe taſtes, peculiar to certain ſoils, are equally met with in all the different kinds of fruit which grew in that ſame ſoil. Thence, I conclude, that there are certain juices, the taſte of which is not to be altered by the organs of vegetables; but this obſervation proves, that they are indifferently infectious to different plants, and that they mix with the nutritive juice, ſtill preſerving ſomething of their original character.

The ſame thing is obſervable in the animal kingdom. I have eat, at the late M. de Reaumur's, Chickens, the fleſh of which ſmelt of Garlick; becauſe they had mixed that plant with their food. In like manner, a Rabbet, which had been fed at M. de Maleſherbe's with nothing but Sage had its fleſh ſtrongly ſcented with the odour of that plant.

We may add, that Madder, mixed with the food of different animals, renders the bones, that are formed in the time it is uſed, of a very beautiful red colour. But theſe exceptions ſhould be no obſtacle to our concluding, in general, that aliments change their nature in the internal parts of animals and vegetables; to form in the laſt, wood, bark, and the ſubſtance of fruits, &c. and in animals, fleſh, tendons, bones, &c.

It is true, we cannot boaſt of having a perfect knowledge of any part of vegetables; but Grew, Malpighi, myſelf, and, I venture to ſay, all the Naturaliſts, have found on the ſurface of the roots only a ſpungy ſubſtance, which ſeemed indifferently diſpoſed to imbibe every kind of juice which preſented itſelf.

If this is the fact, the juices muſt receive their qualities in the internal parts of plants; and what makes this opinion the more probable is, that I have raiſed in very clear, and very pure water, Capillary plants, bulbs of flowers, different kinds of Pulſe, and even trees; theſe plants have found, in this very pure water, wherewithal to furniſh themſelves with the lively ſmell of Balm, the ſweet taſte of the Bean, the acrimony of the Oak, the bitterneſs of the Almond, and the viſcoſity of the buds of the Horſe Cheſnut-tree; and, by a chemical analyſis, theſe plants yielded the ſame extracts as thoſe that were raiſed in the earth.

Tho' the knowledge we have of the mouths of the pores of roots is very contracted, yet it is poſſible to prove, that theſe roots indifferently imbibe juices of very oppoſite qualities. By a chemical analyſis, nitrous ſalts, vitriolic ſalts, and ſea-ſalt, are extracted from plants. It is not at all probable theſe three mineral acids ſhould have been formed in the plants.

I have, beſides, put the roots only, of young plants, into tinged or ſcented liquids, and have met with manifeſt traces of theſe liquids, even in the leaves and fruit. Some have alſo been of opinion that every thing capable of being diſſolved by water, indifferently finds a paſſage into plants; and this, with a few reſtrictions, may be admitted. But they have farther imagined, that each plant appropriated to its uſe only ſuch parts as were proper for its nouriſhment, the reſt paſſing off by tranſpiration: it is this point that cannot be allowed; for all that have examined the tranſpiration of plants, could perceive nothing in it but a pure phlegmatic matter.

It is neceſſary to remark, that, by admitting plants only to appropriate to themſelves what is neceſſary, it would of courſe follow, that the earth would be as much impoveriſhed, as if all plants were fed with the ſame juice; for, as the tranſpiration mingles with the air, and is diſperſed at large, it cannot well be ſaid to fall again on the earth, which produced it, and that this earth is fertilized by it.

An objection might be made to the identity of the nutritive juices of plants, by remarking, that certain ſoils ſeem more proper than others for the growth of certain kinds of plants: one ſoil is proper for rye, another for wheat, this for meadows, that for artificial paſtures, &c. and the reaſon for this concluſion is, becauſe the nutritive juices of theſe plants are found there in greater plenty than elſewhere. I do not controvert this obſervation; but does this depend on the nature of the juices contained in the earth? or, may it not be attributed to another cauſe?

To oppoſe one obſervation to another, I ſhall remark that, in all appearance, the ſame earth can afford nouriſhment to every kind of plant. Thyme, which commonly likes a dry ſoil, will thrive, if planted in the earth of a marſh carried to the top of a hill; in like manner, a tuft of ruſhes will thrive in earth taken from the ſame hill, provided it is carried into a marſh. It does not then, in this caſe, proceed from the nature of the earth that thyme grows naturally on the hill, and the ruſh in the marſh; but becauſe the ruſh requires more water than the thyme, which would periſh in too moiſt a ſoil.

This may be carried farther. Botaniſts know that all plants, not only of our Temperate Zone, but alſo of the Frigid and Torrid Zones, live in the earth of our climate, provided they are ſo ſituated as to enjoy a degree of heat and moiſture ſuited to their conſtitution. This being premiſed, good earth appears to agree with all vegetables; and, in fact, the plants we meet with in a bad ſoil, grow with an uncommon vigour, when found in fertile land.

We may add, that plants which bear largely, have occaſion for a greater depth of good earth. That which is only ſix inches deep, may afford nouriſhment to plants whoſe roots extend not very far in the earth, ſuch as almoſt all annuals. But this depth of earth will not be capable of affording ſufficient nouriſhment to Lucerne, much leſs to trees.

This, and other the like circumſtances, may be the cauſe that certain plants thrive better in certain ſoils than others, without attributing it to any eſſential influence which can proceed from the nature of the juices contained in the earth.

In order to ſupport the heterogeneity of the nutritive juices of different plants, it is farther remarked that, if a tree dies, in any ſpot, of age, another tree of the ſame kind being planted there, ſeldom ſucceeds; and that it is more proper to plant a tree of a different kind; becauſe, ſay they, the earth is exhauſted of the juices proper for the ſort of tree that died of age; but contains others proper for the nouriſhment of trees of a different ſpecies.

I allow that the difference of the nutritive juices furniſhes a very natural explanation to this obſervation; nevertheleſs, many other cauſes might be aſſigned. The tree which is ſuppoſed to die of age, may have died thro' ſome particular default of the ſoil, by means of ſome inſect's having deſtroyed its roots; or, perhaps, of a decay, cauſed by its being drained of its ſap by ſome paraſite plant, which has ſecretly robbed it: it may even turn out, that the rotting of the roots of this old tree, or certain ſecretions which the earth may have imbibed, have rendered this ſoil unfavourable to that ſpecies of tree only.

But to continue our relation of the facts, which ſeem to favour the heterogeneity of the nutritive juices of plants. All farmers agree in thinking that it is beſt to ſow ſucceſſively in the ſame land different ſeeds; ſuch as wheat, barley, oats, peas, millet, turneps, &c. by this change, they can have ſucceſſive crops from the ſame land, which they could not have if they always cultivated the ſame kind of grain.

After being convinced of this fact, I ſhall remark, that if barley ſucceeded well after wheat, only becauſe the earth had retained the kind of juice proper for the nouriſhment of barley, it would follow, that a good crop of wheat ſown on a barley-ſtubble might be expected, as the barley would not have devoured the juices proper for the wheat. Nevertheleſs, the crop of wheat would, for the moſt part, be bad; becauſe wheat does not ſucceed, unleſs the land has been prepared by three or four good plowings: on the contrary, barley, which is leſs delicate, and requires not ſo much nouriſhment, ſucceeds tolerably well in a field that has had but two plowings. But this barley would give moſt amazing crops, if ſown on land prepared as for wheat.

It may be added, that if every plant only drew from land the juices adapted to its ſpecies, the year of fallow might be omitted, and the firſt year wheat might be ſown, the ſecond barley, the third oats, then buck-wheat, peas, maize, millet, &c. It muſt be allowed that by this method, continued without interruption for a number of years, but very weak crops would be got, the year of fallow being neceſſary to give the land the plowings requiſite to divide its parts and kill the weeds.

Another obſervation is made to prove, that plants of different kinds require not the ſame nutritive juice, which is, that a poor land left untilled, and ſuffered to cover itſelf with graſs, at the end of a few years ſo far recovers itſelf as to be in a condition of yielding tolerable crops. In like manner, good crops are had from either natural or artificial paſtures, newly broke up, without the help of manures. Theſe lands, ſay they, inſtead of being exhauſted by the graſs they produced, reſemble freſh earth.

If corn ſucceeds well in paſtures broke up, it is probably becauſe the graſs, being nouriſhed by the ſurface of the land only, the inferior earth remains unimpoveriſhed, being even meliorated by the rotted leaves and roots. Saintfoin and Lucerne ſhould be excepted from this rule, as they puſh their roots far into land; and, perhaps, as they ſeek their food at a great depth, they do not exhauſt the ſurface. On the contrary, they enrich the land by their leaves, which rot; and this enriched ſurface is ſufficient for the growth of annual plants.

The moſt natural concluſion to be drawn from theſe obſervations, is, that plants do not render the earth barren, and that they never injure each other, unleſs it is during their growth; and if they do it then, it is, perhaps, by conſuming the moiſture, which is the chief vehicle of their nouriſhment. It is, probably, on this account that trees are killed when Saintfoin is ſown on the land in which they extend their roots.

We may ſay, with Mariotte, that the principles of which every plant is compoſed, are the ſame, at leaſt with reſpect to ſuch principles, as are moſt obvious to our ſenſes. If they have others peculiar to each plant, it is not in our power to ſeparate and demonſtrate them apart.

To prove this propoſition by an experiment: Take a garden-pot with ſeven or eight pounds of earth in it, and ſow therein any plant you pleaſe, it will find in this earth, and the rain-water uſed to water it, all the principles proper for its nouriſhment. When it has attained its full growth, let the earth of the pot be ſtirred, and ſow another kind of plant, watering with rain-water as you did the firſt, and it will thrive; and in this ſame earth you may raiſe as many roots of plants as you pleaſe. But if the ſalts, oils, earths, &c. of every one of theſe kinds differed from each other, it would be neceſſary that all theſe principles ſhould exiſt in this ſmall quantity of earth, and the rain-water uſed to water it; yet this is impoſſible. For tho' each of the plants raiſed in the pot ſhould yield but one drachm of fixed ſalt, two drachms of earth, &c. all theſe principles, mixed with their diſtilled water and their oil, would weigh at leaſt two or three ounces; which, being multiplied by the number of the plants ſuppoſed to be ſucceſſively raiſed in the earth of this pot, would amount to much more than the weight of the earth in the pot.

After the experiments and obſervations I have related, I muſt forbear making any poſitive concluſion on the nature of the nutritive juice of plants; and, notwithſtanding the ſucceſs of my experiments on the vegetation of plants in pure water, I am apt to think, with Mariotte, that the juices imbibed by plants are not ſo pure a water as that which I employed. It may, perhaps, be the ſame with regard to theſe plants as with certain fiſhes, which live for a long time in the moſt pure water, but grow thin, and would in the end die if other food was not given them. Our experiments will, at leaſt, undeceive ſuch as think this vegetative virtue depends on a pretended nitre, which many authors have taken occaſion to mention.

With reſpect to the preparation liquids receive in the internal parts of plants, there is not the leaſt doubt but they depend on ſo refined a mechaniſm, that it has hitherto eſcaped our reſearches. Neither is this matter of ſurprize, ſince the ſame queſtion, with reſpect to animals, remains as yet undecided, notwithſtanding the reſearches of the moſt celebrated Anatomiſts.

What we have ſaid relative to the nutritive juice of plants, may induce us to be of opinion.

I. That many plants of different kinds are fed by nearly the ſame ſubſtance.

II. That there is no plant but what robs of food all within its reach.

III. That a ſoil once adapted to one kind of plan will always be in a condition to ſupply it with food, provided it is properly cultivated.

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ARTICLE XXVI.

An Eſſay on the Conſtruction of Highways; by M. FR. L. HALDIMAND, *Secretary to the Bailiwick of Yverdon in Switzerland.*

AMONGST all the monuments we have of the grandeur of the Romans, none are greater teſtimonies of their power and wiſdom than the Highways which remain of their conſtruction.

The fall of that vaſt Empire occaſioned Sciences and Arts to decline; every thing bore the character of the Barbarians who made the conqueſt, and the moſt deplorable ignorance ſeemed for ſeveral ages to have baniſhed reaſon and taſte; every thing drooped in thoſe unhappy times, induſtry and commerce were neglected, and the magnificent Highways were ſuffered to go to ruin.

It was neceſſarily a work of many centuries to diſſipate the cloud which obſcured human reaſon, and to reſtore a taſte for Sciences and Arts to men who were barbarized by ignorance, prejudice and ſuperſtition.

In our age, however, this point ſeems to be gained, and to its honour it may be ſaid, that being at leaſt equal to Greece and Rome in their moſt ſplendid times, it ſurpaſſes them in a taſte for every thing that can contribute to the good of mankind.

This is the end propoſed by the numerous Societies which have been formed, and this is in particular the plan laid down by the illuſtrious Œconomical Society of Berne.

For this ſame end, having maturely conſidered the many blunders made by ignorant ſurveyors on our public roads, I thought it incumbent on me to write an Eſſay on this ſubject.

Every thing I ſay is founded on a long experience, and may be of ſome uſe to thoſe who, not having this experience, may be called to ſuperintend ſuch works. I have been very particular, ſome may perhaps think too much ſo, but having nothing in view but the good of my country, I imagined every thing eſſential which could in any ſort promote it.

I divide this Eſſay into two parts, the firſt treating of the manner of making Roads, and the ſecond of keeping them in repair; to which I ſhall add a few remarks on their utility, and the advantages which reſult from making them.

PART *the* FIRST.

Of the Conſtruction of Highways.

A knowledge of the true principles is indiſpenſably neceſſary in every art; and that of making great Roads requires, as much as any other, ſome preliminary pieces of knowledge very neceſſary in a ſuperintendant or ſurveyor. A beaten tract of knowledge is but a bad guide in caſes which very frequently happen, where, amongſt ſeveral ways, the beſt is to be preferred.

Integrity in a ſurveyor is not leſs eſſential than activity; he ſhould merit the confidence of his employer, and be continually attentive to whatever is committed to his care.

A ſurveyor, after laying out the road, ſhould, himſelf, in the beſt manner diſtribute the workmen, by dividing them into ſeparate bodies, to avoid confuſion.

ſion. He ſhould often viſit the works, and particularly at the end of every week, at which time he ſhould receive and ſettle the liſts of every overſeer, in order to pay him the amount, which this laſt is to diſtribute to the workmen.

They ſhould make choice of particular overſeers. A proper knowledge of their buſineſs, honeſty, activity, and punctuallity, qualities they are ſuppoſed to poſſeſs, ſhould alone influence the ſurveyor in his choice.

He ſhould furniſh every overſeer with clear, preciſe, and plain orders, and not puzzle him with too great a number of workmen, that he may the better ſee that they do their duty.

One eſſential duty of every overſeer is never to leave the workmen, and he ſhould call them over three times a day, morning, noon and night, and he ſhould admit of no parts of a day leſs than one half.

The overſeer ſhould without favour or partiallity, acquaint the ſurveyor if he has under his care any lazy or mutinous workmen, that they may be diſcharged, for fear of giving a bad example to the others.

The hours of work ſhould be regulated by the ſurveyor, according to the ſeaſon of the year, and the nature of the work: he ſhould alſo fix the price of the carriage, regard being had to diſtance and to the ſtrength of the team, for ſuch as are to be paid by the journey.

The materials for making drains, for bricklayers or maſon's work, and bringing turf, being the only articles which will require unequal loads, the carriage of them ſhould be paid for by the day. Every thing elſe is to be paid for by the journey, and every journey the overſeer is to deliver a tally, which is to be notched at the corner if the carriage is not properly loaded, in this caſe it is to be paid for only as half a load.

The overſeer ſhould every night take up all the tallies given out in the day, in order to charge them in his book; and if he is obliged on any account to be abſent, he is not to truſt the giving out or taking up of theſe tallies to any but a workman pitched on for that purpoſe by the ſurveyor.

The workmen ſhould find their own ſhovels and pick-axes, but if there ſhould be occaſion for any other tools, they ought to be found out of the public money, and committed to the care of the overſeers.

The firſt thing to be done in a Road of any extent is to lay down a plan of it, in order to its being made ſtraight. If, in laying down this plan, there ſhould be any conſiderable aſcents or deſcents, they muſt be noted on the plan, diſtinguiſhing ſuch as are moſt ſteep, that they may be helped when the work comes to be executed.

The ſurveyor muſt not be afraid of working in new land, whether to ſhorten the road, or to avoid filling up hollow ways, as the purchaſe of the ground will be but a trifle, and a conſiderable ſaving often enſues; and beſides, ſome advantage may be made of the old road, either by ſelling it or changing it with the proprietors of the neighbouring lands.

The width of roads is various, according to their deſtination, the largeſt Roads in this country (Switzerland) having twenty-four feet for carriages, three feet on each ſide for banks, and the ſame for ditches, amounting in the whole to thirty-ſix feet: the leſs public Roads are about thirty feet wide, and the croſs Roads about twenty feet in the whole. A greater width would incroach too much on the arable land, and would be too chargeable both to make and keep in repair; however it muſt be obſerved, that near towns, pleaſure and convenience ſhould go hand in hand, and the roads ſhould be wider and perfectly well kept in order.

If the Road is to croſs a wood, it will be proper to make it at leaſt ſixty feet wide, as well for the greater ſecurity of the traveller as to make the Road more airy.

The banks, which are between the ditches and the Road, are very neceſſary to prevent the materials of which the Road is made from falling into the ditches; they ſhould never be leſs than two feet wide, and if three feet, it will be ſtill better, and theſe banks ought to be ſloping towards the ditches.

The ditches are very neceſſary for receiving and carrying off the water; the moſt ſuitable width for them is three feet, as to the depth, it muſt depend on the nature of the ground and other circumſtances: when the ground lays low, and is moiſt, the ditches muſt be made wide and deep, to have wherewithal to raiſe the Road; in ſuch caſes, to prevent the bank from mouldring, it will be proper to turf the ſides, which is better than brick-work, as the water will drain through it. In ſome places the ditches may be made very ſhallow, and in others there need be none at all; this will appear at firſt view, and ſhould not be neglected by the ſurveyor, as it will be a means of ſaving much expenee.

It is abſolutely neceſſary that the upper ditch ſhould frequently diſcharge its contents into the loweſt, for which purpoſe a vent muſt be procured, and this may be effected two ways; one is by means of drains which go under the road, which ſhould, if poſſible, always be made of brick or ſtone-work, and ſo large that, if they ſhould chance by any accident to be ſtopped up, a boy may go in to clear them; the bottom particularly ſhould be well paved: the other way, when the ditches are not deep, is to cauſe this water to croſs the road running over it, a ſlope being for that purpoſe made.

It is abſolutely neceſſary that a Road ſhould be higheſt in the middle, but it ſhould not be too high, becauſe in this caſe the carriages will only go in the middle for fear of overturning, or of ſliding down when the ſnow is hard, and when all parts of the Road are not equally uſed, the natural conſequence muſt be deep ruts: ſo that upon the whole it ſeems that a riſe of one foot in the middle, when the Road is twenty-four feet wide, and well ſettled, will be ſufficient, and other widths in proportion.

After having made theſe preliminary obſervations, I now come to the method of conſtructing public Roads.

I. The firſt thing to be done is diligently to ſurvey two or three times the country where the Road is to be made, in order to be a judge of its ſituation; and to mark out the ground with parallel ſtakes, of a proper width, laying out the Road as ſtraight as poſſible, provided too great an expence is not thereby incurred.

The ditches are then to be opened, and the earth which is thrown out of them is to form the banks on the ſides of the Road, and not to be thrown into the middle as ſome recommend, in order as well to begin the riſe the Road is to have in the middle, as to prevent the water from ſettling there; but theſe two prejudices are to be removed in an inſtant. With regard to the firſt, the ſolidity of the Road depends on the quantity of materials that are laid on it, and experience confirms it to us, that theſe ſhould be to the depth of two feet and a half, or three feet; now, if the foundation on which theſe materials are laid, are rounded in the middle, it is eaſy to conceive that the Road would have too great a riſe, and the conſequences already mentioned would enſue. As to the ſecond, when the road is once ſettled it is impoſſible the rains ſhould ever penetrate through it, for what water does not drain into the ditches will ſoon be exhaled by the ſun and winds.

In ſome places they are at conſiderable expences to procure large ſtones for the borders of the Road, to prevent the materials of which it is made from ſpreading; but experience has proved this to be quite unneceſſary, as we ſee no Roads hurt for want of theſe ſtone borders; and common ſenſe will eaſily convince us that irregular ſhaped ſtones, loaded with the conſiderable weight of thoſe above them, and fixed in their places by the fine gravel and earth which fill up the interſtices betwixt them, the lower ſtones being firmly fixed in their beds by the weight of the whole Road, cannot certainly ſpread or give way by the (comparatively ſpeaking) ſlight impulſion of waggon wheels.

The largeſt ſtones ſhould be laid at the bottom of the Road, regularly diſpoſed, yet not with too much nicety; then the ſmaller ſtones are to be laid over them, and being brought nearly to a level, about a foot depth of gravel ſhould cover the whole; the ſmall particles of this gravel being carried down by the rains, and the joltings of the carriages, get into the void ſpaces betwixt the ſtones, and the whole becomes bound in one ſolid body; but as the gravel is by this means leſſened in quantity, ſome time afterwards, when it has been ſettled a little by the carriages, it will not be amiſs to lay on another bed of it, and if there ſhould be occaſion, a third. When the work is ſo far advanced, it will be neceſſary to have a perſon conſtantly employed to fill up the ruts, and caſt up the gravel into the middle of the Road till it is thoroughly well bound, and has acquired a proper conſiſtence.

In order to do this work as it ſhould be, it will require between thirty and forty loads of ſtones and gravel to make ten feet running meaſure, twenty-four feet wide, and other widths in proportion; but if the Road is not to be very much frequented leſs may ſerve.

It is abſolutely neceſſary to get as good gravel as poſſible, and as little mixt with earth as can be procured; when there is too much earth in it, the beſt way is to ſcreen it, or elſe the firſt rain will produce a large quantity of dirt and mud, particularly if the earth mixed with the gravel is of a fat greaſy nature. For this reaſon, the beſt gravel ſhould diligently be ſearched for. Signs of it are ſometimes ſeen on the ſurface of the land, but when this is not the caſe it muſt be dug for on the hills in dry parched ſpots, and where ſprings of water iſſue from the ground.

Gravel is not every where to be met with, particularly in the mountainous part of the country, where they are obliged to uſe rock ſtones inſtead of it, but they are not ſo proper for the purpoſe. In ſome places they are under a neceſſity of breaking ſtones to pieces to ſerve inſtead of gravel; and in others they uſe a kind of hard binding ſand, which makes very good Roads.

In towns and villages the inhabitants cannot do better than to pave their Streets, for the frequent gathering of the mud carries away all the gravel.

II. To carry Roads through marſhy or boggy grounds, in order to prevent a great quantity of materials from being uſed, and this frequently repeated, a number of faggots ſhould be made of green wood, as long as the width of the Road, and bound in different parts: theſe are to be laid ſide by ſide, and ſtrongly bound together, and over them is to be put a good bed of ſtraw, or coarſe marſh hay, upon which the materials for the Road are to be laid, without being under any apprehenſion of the faggots rotting; becauſe, being out of the reach of the air, and always wet, they are effectually preſerved from any danger of the kind. When the ditches are made, the earth muſt not be thrown on the Road, but the faggots muſt be laid immediately next to the upper turf or ſward, or the Road will not be ſecure and ſolid.

When the turf or peat-earth conſiſts of a number of roots which bind it together, large and deep ditches may be made, in order to procure a conſiderable quantity of this turf, which is to be laid on the faggots to raiſe the Road, and form it into a cauſeway, taking care to diſpoſe the upper turf very regularly at the edges and on the top. When this laſt turf has again taken root, and the whole has acquired ſome degree of conſiſtence, it is to be loaded with ſtones and gravel, without being under any apprehenſion of theſe materials ſinking and being loſt; the roots will keep them up, and the lower part of the cauſeway being much drier than at firſt it was, will prevent the impulſion of the waggon wheels from having any immediate effect on the ſoft part, the weight being divided on too large a baſis to produce any bad conſequences.

It may be neceſſary, however, to obſerve, that it is only in bogs this method is to be practiſed. When there is only a wet and clayey bottom, all that is to be done is to make good ditches to carry off the water, and ſometimes to raiſe the ſoil a little; after which the Road is to be made in the ſame manner as on dry grounds: the few materials which will ſink before it gets to a ſound bottom, not being an object of ſufficient importance to occaſion our taking the precautions recommended in boggy grounds.

III. In aſcents and deſcents care muſt be taken to eaſe them as much as poſſible. Such as are not long, may be remedied by taking a great deal of earth from the top, and filling up with it the bottom; this, by lengthening the ſlope, will of courſe make it eaſier; but when we find aſcents or deſcents which are too long or too ſteep, and which cannot be avoided by paſſing on one ſide, we muſt endeavour to make the Road compaſs it as it were, for there is no other way of eaſing the ſlope but by lengthening it; and if this cannot be done, the Road and the upper ditch, (for there muſt be none below) ſhould be well paved, and there ſhould be here and there open drains to give a paſſage to the water out of the ditch, that it may not damage the Road.

When the ſide of a hill is to be paſſed, after having traced and marked the middle of the Road, a wall of ſtrong work is to be built at the diſtance of half the width of the Road below this middle mark, and is to be raiſed as high as the middle. The ſpace below is then to be filled with the earth or ſtone that is taken from the upper half, a reaſonable ſlope being left on the top. That the ditch may not be ſpeedily filled, there ſhould be ſeveral croſs gutters to carry off the water; but great care muſt be taken in the choice of the ſtones of which they are made, and that they be fixed deep in the ground, and well ſupported by others, leſt they ſhould be diſplaced and occaſion the carriages to jolt too much.

When a Road is to be made on a ſolid rock, whether on a mountain or in a plain, it is not enough to blow up the rock and level the way, as this would laſt but a very little while, but the rock ſhould be covered with large ſtones to the thickneſs of two feet, then ſmaller, and over all, the ſmalleſt ſtone rubbiſh, which together will form a ſolid maſs, not to be put out of order by the jolts of waggon wheels.

If there is a neceſſity of making ſhort turnings or elbows, the Road in ſuch places ſhould be at leaſt twice as broad as in the other parts, that the thiller horſe may not have the whole load to draw whilſt the others are turning; and ſuch place ſhould alſo be made as level as poſſible.

Roads on mountains being very ſubject to be filled with heaps of ſnow, ſome large piles ſhould be driven at proper diſtances on each ſide of the Road, in order to diſtinguiſh it.

IV. When a Road runs along the bank of a river ſubject to overflow, or runs through a bottom ſometimes filled with water, a cauſeway ſhould be raiſed at leaſt two feet above the higheſt riſe of the water, ſupported by ſtrong walls; but if it does not require to be much raiſed, a long ſloping bank well turfed may do.

If the Road is near a torrent that is apt to change its bed, and threatens to damage or deſtroy the works, inſtead of defending the Road at a great expence by large banks, it is much better to apply the remedy where the torrent has broke from its channel, and there make a ſtrong wall or bank to oblige it to reſume its ancient courſe; this is by much the beſt, as well as the leaſt expenſive and dangerous way.

V. There are, on the borders of lakes, Roads which, when theſe lakes are filled with water and agitated by the wind, are in danger of being deſtroyed by the fury of the waves. If, in order to remedy this, it ſhould be judged proper to make wharfs of hewn ſtone, it is abſolutely neceſſary that the maſon's work ſhould be raiſed on a ſtrong frame of timber, ſo that the whole may form one entire maſs capable of reſiſting the waves. This frame work ſhould always be under water, even when it is at the loweſt; and it will be proper to defend the works by a few rows of ſmall piles interwoven with the branches of willows or oziers, that the waves may not in their reflux carry away with them the ſoil or gravel on which the frame work reſts: but as the lakes ſometimes riſe about five feet in the ſpring, on the melting of the ſnow, the wharfs ſhould be made at leaſt eight feet high, that they may not be overtopped by the water; by which it is evident, that this method is very expenſive, and not be practiſed to any conſiderable extent.

Inſtead of this method, large oak piles may be driven down, ſo as to form a dyke; theſe may be kept in their places by oak traverſe pieces, the ends of which may reſt on piles ſhorter and more advanced than the firſt: behind theſe piles the work of making the road may be begun, by laying down large ſtones, which will not paſs through the intervals of the piles. When the work is raiſed about as high as the croſs pieces, laid half as high as the Road, ſome pieces of oak, twelve feet long or more, are to be got, the largeſt ends of which are to reſt on the middle of each croſs piece, lapping enough over it to ſteady it by means of a deep notch, or a pin driven into a large hole: the reſt is to go into the Road, and is to have at the other end a travefe, or croſs piece, at leaſt eight feet long, which is to be fixed down by common piles; after this the Road is to be compleated. In this manner the great piles will be kept ſteady by the traverſes or croſs pieces, and theſe laſt, by the pieces or arms which enter into the ſubſtance of the Road, the weight of which keeps all in due order.

If there happens to be ſuch a bottom as makes it improper to drive piles, a border of as large ſtones as can be procured muſt do, but they muſt be laid deep, and lengthways towards the Road. Behind theſe ſome ſmaller may be put to form the Road, but they muſt be regularly diſpoſed that they may ſerve as a foundation to the upper border; on the firſt bed may be put a ſecond, till it is raiſed to a convenient height, obſerving to allow a proper ſlope.

In places where the lake is not very deep near the banks, and where large ſtones are at hand, it would be of great ſervice to raiſe ſome large heaps at a proper diſtance from the ſhore, ſo that they are ſome feet above the water, driving round them ſome large oak piles.

Theſe great heaps receiving the impulſe of the waves, which would break on them, would doubtleſs

leſs at firſt be put out of order; but when their bottom was extended, and they were loaded with more ſtones, the vacancies of which would be filled by gravel, they would form a maſs capable of reſiſting the waves, the impetuoſity of which is moſtly derived from a ſucceſſive motion, without obſtacle, and which would therefore of courſe looſe a great part of their power before they reached the bank. By making theſe heaps or moles at firſt about 200 paces one from the other, it is not to be doubted but they would have ſo good an effect, that others would afterwards be made between them: beſides, it is to be preſumed that the waves would caſt behind the moles heaps of gravel, which would give them a ſtill greater conſiſtence.

On ſhores where there is a great deal of gravel, dams may be made to run out into the lake, leaning towards the wind, which generally blows in that place; the angles they form with the ſhore will, by the violent agitation of the water, be filled with a large heap of gravel, which may be taken away and uſed wherever there is occaſion for it, as another heap will ſoon gather.

Theſe dams, if large ſtones are at hand, may be made entirely of ſtone-work like the above mentioned moles, beginning near the ſhore: If this is not the caſe, to ſave expence, frames may be made with large pieces of timber, theſe may be laid one on the other to the number of three or four, if there ſhould be occaſion, after which the empty ſpace in the middle may be filled with whatever materials are at hand, and the whole will form a maſs capable of reſiſting the waves.

VI. In all the preceding parts of this Eſſay, only great Roads have been the ſubject; and to ſay ſomething of the croſs Roads which come into them, it would be uſeful if, in every hundred, commiſſioners were appointed, ſenſible intelligent men, to ſee where they would be of moſt uſe, and to draw up a plan of the manner in which they ſhould be made; regard being had to the nature and extent of the Roads, the ability of the inhabitants, the diſtance from which the materials are to be fetched, and to there not being any occaſion for making them as ſolid and regular as the great Roads: when this was done, orders might in conſequence be iſſued to the hundreds, with inſtructions to mend their Roads.

Before I conclude this firſt part it may be neceſſary to obſerve, That when rocks or large ſtones are to be blown up with gunpowder, it is beſt to uſe borers about ſix feet long. Their weight will ſoon give them entrance, and they only wear at the end that bores, which is from time to time to be new laid with well tempered ſteel; one man will manage them without uſing a hammer: on the contrary, with a common borer, two men ſtrike whilſt a third directs it, and the inſtrument is ſoon rendered unfit for uſe. The rock muſt be bored dry, and it is better to uſe ſome of the fragments of the rock, well driven in, to fill up the hole after the powder is put in, than a plug of wood, leaving a ſmall place to ſet fire to it.

If long ſtones are to be blown up, they are to be bored lengthways, and the powder will have a greater effect. Experience alſo teaches us, that if they are bored into the part which touches the ground, it will be of advantage; therefore, when it can be done, they ſhould be turned over, or thrown into a hole dug on one ſide of them.

Whenever the workmen meet with rocks that are ſplit and ſhivered, ſo that the powder will not have any effect on them, large iron crows are uſed, with ſledge hammers, wedges and pick-axes.

It is of great uſe to ſee what part of the work can be done by undertakers, ſuch as digging the ditches, carrying the earth, turfing, &c. it being often advantageous to make ſuch contracts; but then great care muſt be taken in making the bargain, that the ſurveyor is not impoſed on.

SECOND PART.

Of keeping the Roads in repair.

Beſides the good regulations which already ſubſiſt in the ſeveral diſtricts, with reſpect to keeping the Roads in repair, it will be proper to have an intelligent overſeer who ſhall be ſworn to do his duty, and is capable of making himſelf reſpected. To him ſhould the care of a certain quarter be committed, with expreſs orders to viſit the Road every two months, noting down all the defects he may meet with, ſuch as ſinkings in the Road, deep ruts, breaches in the ditches, drains damaged, pavements out of repair, ditches filled up, or any nuiſances whatever in the Road, of which he is to make his report to the juſtices of the peace, who will in conſequence iſſue out an order to the reſpective pariſhes to ſet about what repairs may be immediately neceſſary, under the penalty of a certain fine in caſe of neglect: if the work is not then done, before the next viſitation, the fine ſhould be levied and the order renewed, with an injunction, that if it is not done before the next viſitation, the juſtices will order the work to be done at the expence of the pariſh ſo neglecting.

The other leſs preſſing repairs, ſuch as ſcouring the ditches, or laying on freſh gravel wherever it is wanting, may be poſtponed to ſome leiſure ſeaſon of the year, at which time ſuch pariſhes as have not gravel near at hand, will do well to get together ſome large heaps, ready to uſe as occaſion may require.

Waggons or carts with broad fellies to the wheels do leaſt damage to the Roads. Heavy loads ſhould not be permitted with narrow wheels, as they hurt the Roads greatly, particularly in coming down hill, when they are obliged to chain a wheel; this wheel ſhould be ſupported by a piece of wood faſtened to it, which, by its greater breadth, would occaſion leſs damage.

The Road ſhould not be littered, nor the ditches filled up with the ſtones picked up off the arable lands, nor with wood, faggots or dung.

The hedges ſhould be regularly cut, to give air to the Roads, and prevent the ſnow from gathering.

In every village there ſhould be a particular overſeer, who ſhould frequently viſit the Roads, cauſe the ruts to be filled up, and the moſt neceſſary repairs to be done. There are ſome very good laws on theſe heads which ſhould be enforced.

Without preſcribing the fellies of the wheels to be made as wide as they are in England, namely nine inches, it would yet be proper to have them wider than are commonly made, and that the heads of the nails that faſten the tires ſhould be let into the iron; by this means deep ruts would in a great meaſure be avoided.

It is not by any means proper to ſuffer trees to be planted on the banks of a Road; if the owner of the lands adjoining to the Road chuſes to plant trees, let them at leaſt be four yards from the edge of the Road; and if rows are to be planted, let the trees, according to their kinds, be at the diſtance of thirty feet one from the other, or more.

Remarks on the Utility of Public Roads.

Though I intended at firſt to have treated only of the Conſtruction of great Roads, yet I imagine a few remarks on their utility may not be diſpleaſing.

The good of individuals is ſo intimately connected with the proſperity of the ſtate, that it is now become an axiom in politicks; I ſhall therefore confine myſelf to ſetting forth only a part of the advantages derived to Society in general from the eſtabliſhment of public Roads.

They ſave a great deal of labour, promote population and induſtry, and give new life to Agriculture. The great benefit reſulting from them will ſoon repay the expence of their conſtruction.

Agriculture, which on all accounts ought to be encouraged, derives many advantages from them. The farmer, who ſometimes carries goods for hire, can go his journies in good Roads with fewer cattle, leſs labour, and in a ſhorter time. As to his particular ſelf, he alſo receives benefit from them, being leſs expoſed to the diſorders ariſing from his heating his blood, and from his labour in getting his carriage out of a deep rut, when it may chance to ſet, without mentioning the continual danger he is in of loſing his life, or of being maimed by the ice in the Roads, or his carriage overturning.

His draught cattle are expoſed to the ſame dangers, run the ſame riſks, and laſt but a little while in bad Roads, ſo that there are always loſſes to ſupply: on the contrary, in good Roads all this is avoided. His harneſs and traces alſo laſt a much ſhorter time, by the frequent and violent ſtraining there is in bad Roads.

Where the Roads are good, a farmer will have occaſion for fewer draught horſes, and if it is more convenient he may keep oxen, which may always be ſold to advantage.

In certain ſeaſons he will alſo find it of ſingular advantage to be able to bring home in a ſhorter time ſuch part of his crops as may happen to lay at ſome diſtance from his houſe; and it muſt ſurely be eſteemed a very particular advantage when a farmer has good Roads round him, ſo that he may with greater eaſe carry his corn to the neighbouring markets.

Inland trade is often hurt by the delays which bad Roads frequently occaſion, but good Roads give a briſkneſs to trade, and cauſe a great ſaving in the article of carriage; and there will ſtill be a more conſiderable ſaving in this laſt article, if it can be contrived that the goods may go part of the way by water carriage, which is by far cheaper than land carriage

I ſhall not enlarge on the innumerable advantages which the towns and counties, the ſea-ports, travellers, and in fact every individual of the ſtate, may receive from good Roads. The eaſineſs of carriage, the quickneſs, ſafety, and ſavings reſulting from good Roads, are objects in which every one has concern.

I ſhall conclude this Eſſay by obſerving, that if we conſider the many advantages of all kinds reſulting from good public Roads, to every member of Society, and ſet them againſt the expences of making ſuch Roads, we ſhall ſoon be well convinced that the government could not do a better thing than to enforce the making them in all parts, as their utility would be immediately apparent, the expences ſoon returned, and the conſequences highly advantageous.

ARTICLE

ARTICLE XXVII.

A Letter to the Authors, *relative to the Lentils of Canada.*

Gentlemen,

I See by Article the Second of your Foreign Eſſays, of which I am a purchaſer, that one M. Dumeſnil Coſté has introduced the Culture of what he calls the Lentil of Canada, in Normandy, and that by ſeveral experiments, which have been made, it ſucceeds very well there.

I find alſo by the Eſſay above referred to, that this plant yields plenty of excellent fodder for horſes and black cattle; therefore, being a great lover of huſbandry, and fond of making improvements in it, I am of opinion, that it would be highly advantageous to introduce the culture of the above Lentil in England, as we cannot have too great a variety of artificial paſtures; the more we have, the better ſhall we be able to adapt ſome of them to every ſoil, ſituation, and expoſure.

I think there cannot be the leaſt doubt of this plants ſucceeding well in our Iſland, the climate of which does not eſſentially differ from that of Normandy, eſpecially in the ſouthern and weſtern parts; and it muſt be acknowledged, that it is more favourable than the climate of Canada, where this Lentil ſeems to be a native.

I ſhould myſelf be glad of an opportunity of trying how far we might depend on ſucceſs in its culture, but that I have no opportunity of procuring any of the ſeed. Let me therefore requeſt, that if any of your readers ſhould chance to know any perſon in England of whom I could procure it, they will be kind enough to inform me, through the channel of this work, and I ſhall not fail acknowledging the obligation.

My reaſon for making this requeſt is, becauſe I think it not unlikely that ſome of this Lentil ſeed may have been brought over in the ſhips which have arrived from Canada ſince it has been in our poſſeſſion; and I had much rather have it genuine from thence, than give myſelf the trouble of procuring it from Normandy, where probably it is not much improved by culture.

I am, Gentlemen,
Your humble Servant,
and Well-wiſher,
RURICOLA.

Wells, Somerſetſhire, Feb. 28, 1765.

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ARTICLE XXVIII.

Some Remarks on the foreign method of mowing Wheat, in a Letter to the AUTHORS.

GENTLEMEN,

ONE of the preſent favorite topics, in converſation amongſt the more intelligent Farmers, is the mowing of Wheat, which has of late found many advocates; on the other hand, numbers think it cannot, to any advantage, be introduced.

A very worthy Gentleman, in Northamptonſhire, made the year before laſt ſome experiments in this matter with three different ſorts of ſcythes, an account of which was ſent up to the Secretary of the Society for the Encouragement of Arts, Manufactures, and Commerce, and afterwards publiſhed in the Muſeum Ruſticum, &c. a well known periodical work on Huſbandry.

This occaſioned many arguments for and againſt the practice, and amongſt others I ſaw, in the above work, ſome very ſenſible letters on the ſubject from the Rev. Mr. Comber, of Eaſt Newton, in Yorkſhire. This Gentleman, with great propriety, recommends, that ſome men from the Wolds in Yorkſhire, where they mow all their Wheat, ſhould be ſent into the South, to convince their countrymen of the many advantages reſulting from this practice.

The arguments on this head produced ſeveral calculations to aſcertain how much would be ſaved in point of labour by mowing Wheat. Theſe calculations of courſe differed; but I do not remember, that any of the ſavings amounted to ſo much as what I ſee mentioned in page 21, of your work, where the Marquis de Coſta ſays, that he ſaves half the expence of labour, and that there are many other benefits attending this practice.

Now if this is the caſe, Gentlemen, ſurely we Engliſh Farmers muſt be madmen not to adopt a method which would be productive of ſo great a ſaving to us, and which would beſides enable us to houſe our corn much ſooner than we now can do.

I generally grow every year about one hundred acres of Wheat, which coſt me, ſay, five ſhillings an acre reaping, making twenty-five pounds in the whole; now to ſave the half would be twelve pounds ten ſhillings, and ſurely this ſum is worth attending to, eſpecially at a time when money with farmers is very ſcarce.

For my part I am well nigh convinced, by what I have read on the ſubject, and am almoſt determined to mow all my Wheat next harveſt, having but one ſingle objection to make to it, which I ſhould be glad if Mr. Comber, or any other public-ſpirited Gentleman, would anſwer.

My farm conſiſts of what is called good Wheat land, rather ſtrong than otherwiſe, and is ſituated in the eaſtern part of the county of Eſſex. Being alſo near a conſiderable market town, I have it in my power to buy plenty of manure, which I never fail doing. The conſequence is, that my crops are for the moſt part large and heavy, from four to five quarters on an acre; now I am rather ſuſpicious, that in ſuch heavy crops a mower would find it very difficult to carry over the ſwarth without ſcattering, and on this would greatly depend the neatneſs of the work.

I wiſh I could know whether the crops of Wheat in the Wolds of Yorkſhire are ſtrong and heavy, or light and thin; if the latter, it would be ſome diſcouragement to me, becauſe, though I am fully ſatisfied, in my own mind, that a thin crop of Wheat may be mown to advantage, yet I cannot ſo readily aſſent, till I know ſomebody has ſeen it done, that a heavy, thick, ſtout crop can be at all mown.

I hope, Gentlemen, you will pardon this trouble; my doubts, in ſome meaſure, aroſe from reading the Marquis de Coſta's aſſertion, and it was natural I ſhould declare them to you, in whoſe work his Eſſay made its firſt appearance in Engliſh.

Mr. Comber is, as I am informed by a perſon well acquainted with him at college, a Gentleman who is very fond of improvements in agriculture, and reads almoſt all the books publiſhed on that ſubject; I have, therefore, not the leaſt doubt but he is a reader of your Foreign Eſſays, which I much approve of, and hope he will give me ſome ſatiſfaction, by eaſing my mind of the abovementioned doubts; and particularly, that he will inform me, and the public, whether there are any ſtrong highly manured lands in the Wolds whereon the Wheat is mown.

I am, Gentlemen,
March 1, your Reader, and obedient Servant,
1765. J. W.

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ARTICLE. XXIX.

An Eſſay on the Culture of Coleſeed, as practiſed by the Flemiſh Farmers, written by the Marquis DE TURBILLI.

COLESEED, as is evident from the etymology of the name, if we derive it from the Latin *Caulis*, is a kind of cabbage, but it grows looſe, not cloſe and cabbaged as the laſt mentioned plant; it has, however, the ſame taſte, and reſembles it ſo much, that it might eaſily be miſtaken for it.

It is cultivated in very large quantities, and with great ſucceſs in the Low-Countries, particularly in the neighbourhood of Liſle, where a conſiderable traffic in it is carried on.

There are three ſorts of Coleſeed, the white, the warm, and the cold.

The white is ſo called on account of its having a white flower; it is not above three or four years ago that it was introduced into Flanders from Holland. They ſay it reſiſts the froſt better, yields ſomewhat more ſeed, and is ripe about ten or fifteen days later than the next ſort.

The warm Coleſeed is moſt common in Flanders, and is eſteemed the beſt, becauſe it thrives in every ſoil, and requires leſs manure.

The cold Coleſeed ſeems to have been brought from Holland as well as the white, it is without doubt the hardieſt, reſiſting the froſt beſt, and grows to a greater height and ſize; it ſometimes attains the height of nine or ten feet, its ſeed is alſo larger, but this difference is ſcarcely perceivable; it is more ſubject to be damaged by inſects than the others, and does not like them ſend forth branches from the bottom of the ſtalk; it alſo requires a greater plenty of manure.

The two laſt mentioned ſorts of Coleſeed have a yellow flower.

All ſorts of Coleſeed are cultivated in the ſame manner; all grow more or leſs towards their natural perfection, yield more or leſs ſeed; and this ſeed is of a better or worſe quality, according to the nature of the ſoil on which the Coleſeed was ſown, the good or bad huſbandry that was beſtowed on it, the favourableneſs of the ſeaſon, and the manner in which it eſcaped other accidents to which it is ſubject.

Every part of Coleſeed is of uſe; the ſeed from which the chief profit ariſes, yields an oil, fit for burning, for making black ſoap, for dreſſing of leather, and the fullers uſe it on their woollen ſtuffs.

All the ſeeds of the ſeveral kinds of Coleſeed are of the ſame form; they are ſmall, round, and of a blackiſh colour; they all of them yield nearly an equal quantity of oil, when they are equally dry and weighty. By bruiſing ſome ſeeds on a table we may diſcover in what degree they are oily, and it is after making this ſlight trial that the merchants fix a price on it. There are above an hundred oil mills at work in the neighbourhood of Liſle in bruiſing this ſeed; they call them Tordoires. Part of the oil that is made in them is conſumed in the country, and the remainder is exported into Picardy, Champagne, and ſeveral other provinces of France.

The duty the farmers-general receive from the rape oil, made in the diſtrict of Liſle only, which is only nine leagues long, and as much broad, amounts to more than 300,000 livres, after deducting the expences of collecting it. This duty is only three livres a barrel, containing about 240 pounds of oil, according to the Marc weight about eight ounces.

We may hence not only judge what prodigious quantities of Coleſeed are raiſed in the whole extent of Flanders, but alſo of what infinite uſe this plant muſt be, when the farmers of theſe provinces are ſo fond of cultivating it, though their lands are capable of yielding any other kind of crop in abundance.

The cakes, from which the oil has been extracted, ſerve to bring up, feed and fatten cattle of all kinds, oxen, cows, and ſheep. They are given to them crumbled and mixed with bran; the cows that feed on them give plenty of milk.

Theſe oil-cakes have alſo a property which is not of leſs value; they are an excellent manure for land on which Coleſeed is intended either to be ſown or planted, and even benefit the crop which ſucceeds the Coleſeed. They uſe them often in this way in the neighbourhood of Liſle. About 300 of them being reduced to powder will manure an acre.

Every kind of cattle will alſo eat the cavings of the ſeed and the little tufts of leaves on the plants. When this fodder is to be kept for the winter conſumption, it muſt be carefully preſerved, or it will rot.

Theſe cavings are alſo uſed for making drenches for cows, and the ſtalks of the large Coleſeed ſerve to heat the oven, to bed the barns, and even to make manure; but this laſt requires time, becauſe it does not eaſily rot.

Coleſeed thrives beſt in deep kindly ſoils, but with plenty of manure and deep plowing it will grow any where. I have ſeen it yield good crops on dry chalky ſoils, on which ſtreet dirt had been laid.

As Flanders is paſt all doubt the country where Coleſeed is moſt uſefully cultivated; I ſhall, with as much exactneſs as I can, deſcribe the methods they practiſe there, and ſhall only mention thoſe of Picardy and the Soiſſonnois, where this culture is leſs extenſive, in order to point out their defects.

Coleſeed is ſown and tranſplanted like cabbages: they give two plowings to the land before winter, and it is not of much conſequence what crop it was laſt under.

In the month of May a deep plowing is given to the land; it is harrowed two or three times, and then rolled, in order to make it fine.

Towards the 18th or 24th of July, it is again plowed, and is alſo harrowed and rolled, till it is reduced, as it were, as fine as aſhes; the ſeed which ſhould not be heated, is then ſown on it, being ſcattered by the three fingers; it is to be lightly covered with the harrow, and afterwards rolled.

Twenty-four pounds of ſeed will ſow three acres, and the plants on theſe three acres will fill twelve others. Coleſeed is tranſplanted after any crop whatever.

The land intended to receive the Coleſeed plants, ſhould be twice plowed, as ſoon as the crop is carried off. About ten or fifteen days afterwards it is to be once or twice harrowed, and towards the end of September it is to have a very deep plowing. In this laſt plowing there ſhould be an open furrow or trench every five bouts. If the field does not lay level, it is to be plowed obliquely, ſo that there may be an eaſy fall for the water.

The beſt and moſt promiſing plants are gathered, and being tied in bunches, are carried to the field where they are to be tranſplanted, by the time the laſt plowing is compleated, and the workmen are ready for them.

There will always remain a number of plants in the land where they were ſown; theſe are generally fed off with cattle, and they never let them ſtand to ripen, except when they manure the land for another crop.

The ſeaſon for tranſplanting Coleſeed is the beginning of October. The plants are placed in rows a-croſs the furrows. The rows are one foot aſunder, and the plants in the rows about ſix inches diſtance one from the other. The manner in which this work is done, is as follows. A certain number of men advance in a parallel line, each having a dibble or ſpade handle, with two large iron points to it, ſix inches aſunder; they drive this inſtrument into the ground; the women and children follow, who put a plant into every hole, and ſettle it with their heel, in this manner working with feet and hands at the ſame time, which it is eaſy enough to do, and it ſaves ſome expence.

When all the Coleſeed is tranſplanted, if the land to which it was removed was not dunged before it was plowed, it muſt be ſown with pidgeons dung reduced to powder; this of all other manures whatever has the moſt immediate and proper effect on the vegetation of this plant; ſixty buſhels will be enough for two acres.

When this is done the looſe earth in the trenches or open furrows, is to be thrown with a ſhovel amongſt the plants in the rows.

Early in the ſpring, a ſpit of earth out of the trenches is in like manner to be caſt amongſt the plants of Coleſeed in the rows. This ſlight tillage gives vigour to the crop, choaks the weeds, and keeps the ſoil looſe.

The rows of Coleſeed form ſo many beds, and when it thrives well the trenches are entirely covered, and the whole reſembles a thick copſe.

It may not be amiſs to mention in this place, that Coleſeed thrives perfectly well in new encloſed lands.

The ſeed is fit to gather about the beginning of July. When it turns yellow, it is reaped like corn, and is laid in pretty large gavels on the beds, where it remains three or four days; it is then carried in cloths, in order to prevent any of the ſeed from being loſt, for it is very ready to drop.

In one or ſeveral parts of the field, in proportion to its extent, and to the quantity of Coleſeed there is, the crop is formed into ſeveral ſtacks.

The Flemiſh farmers never thatch theſe ſtacks; they know ſo well how to make them, that the rain never does them any damage.

The Coleſeed heats in the mow, by that means yielding more oil than it would, if it had not been ſtacked.

In the month of September they make a kind of floor in the field, whereon they threſh and dreſs their Coleſeed.

If a farmer ſhould incline to threſh his Coleſeed without ſtacking, it will be neceſſary for him to leave the gavels longer expoſed to the air on the beds.

Coleſeed may be cut at any time of the day, provided it does not ſhed; if it does, it ſhould only be cut morning and evening.

As a whole field does not all ripen at the ſame time, it ſhould be cut in different portions, being laid in gavels or reaps, the changes of weather will not effect it.

It may be ſafely ſtacked three or four hours after rain, provided it had previouſly been ſometime in gavels, and was judged ſufficiently dry.

In order to clean the ſeed, parchment ſieves are uſed, if there is any wind ſtirring; but if it is calm, wind-fans are ſubſtituted in their ſtead.

The ſeed is put into a granary, and being frequently ſtirred, is preſerved till it is ſent to the mill to be preſſed for oil. That which is drieſt is beſt, and of the dry ſeed the heavieſt yields moſt oil, and ſhould be prefered for ſowing.

The crop of an acre of Coleſeed may one year with another be worth in Flanders betwixt eight and nine pound ſterling (180 livres), from which we muſt deduct ten or twelve ſhillings an acre for the expences of tranſplanting and digging the trenches; but then, if the culture of Coleſeed requires theſe expences, it requires very little ſeed, and the crop is threſhed at a ſmall expence.

As ſoon as the Coleſeed is ſtacked or off the land, the graſs which is found in great plenty is fed down by ſheep, and the land is then well plowed in order to its being ſown with corn.

The open furrows or trenches are filled by one bout of the plow, throwing over a furrow on each ſide of them. It is to be remarked that Coleſeed ſhould not be ſown in the ſame land above once in five or ſix years.

Though they raiſe in Flanders a prodigious quantity of Coleſeed, yet they have not leſs wheat nor fewer oats than in the Soiſſonnois, where they ſow nothing elſe. It is true, that there is a more conſiderable trade in corn carried on there than in Flanders; but then the home conſumption is ten times as large in that country, which is infinitely more populous, full of troops, and where very little land is ſeen to lay fallow. That into which the Coleſeed is tranſplanted is eſteemed ſuch, on account of the tillage and manure it requires.

We muſt not attribute this fertility ſolely to the richneſs of the ſoil of that country; induſtry, a member of inhabitants, and the numbers of cattle and quantities of manure they have, greatly contribute to it. It has like all other countries lands of an inferior quality, and of various kinds; and if the number of people, the cattle, and the manure, were reduced to the ſame ſtate as in the Soiſſonnois, the agriculture of Flanders would not long be ſuperior to that of the laſt mentioned province.

The Flemiſh farmers maintain great numbers of cattle, on account of the eaſe with which they can keep them; beſides the herbage, which they have only in common with other provinces, though in greater plenty, the cakes of the Coleſeed after the oil is preſſed out, which remain to the farmer, are an excellent and very conſiderable reſource. To theſe we may add malt, flax-ſeed, madder-leaves, ſalt at a low price, &c.

This great number of cattle occaſions them to have plenty of dung. Beſides common yard dung, their wood-aſhes, Coal-aſhes, Dutch and Flanders turf, furniſh the Flemiſh farmers with the means of improving their lands.

They alſo know the advantages reſulting from another kind of manure, which it may be deemed indelicate to mention; it is become an article of commerce, the king receives a duty from it, and it cannot be carried to any diſtance without a permit, whilſt in other places it is ſcarcely ever applied to any uſe.

It is then owing to conſtant attention and expence, and to a perfect knowledge and application of every kind of manure, that in Flanders the land owners receive large rents from their eſtates, and the farmers, who pay heavier taxes than in France, tho' levied in a different manner, have ſuch large profits, that they make fortunes.

From theſe obſervations we may conclude, that it would be dangerous for farmers in diſtricts where manures are not in great plenty, to attach themſelves at once to the culture of Coleſeed, becauſe that plant requires ſo much manure, that there would not be enough left for their corn, which the farmers might be apt to neglect, on account of the larger profit ariſing from Coleſeed; but it would be highly uſeful to introduce it by degrees into the beſt lands, and afterwards extend its culture in the ſame proportion, that the quantities of manure may encreaſe. This would occaſion a briſker circulation of money, and the farmer would have a new reſource for maintaing his cattle, and improving his land.

He would in France have a great advantage over the Flemiſh farmer, as he would ſell his ſeed in proportion to the price of oil, which cannot but be encreaſed by the carriage and the waſte in tranſporting it from place to place. Mills uſed to preſs any other ſeed would do for Coleſeed, and indeed it would ſoon be worth while to erect mills on purpoſe, if the culture of this plant was extended to any conſiderable degree in France.

In ſome years corn bearing a very low price, it is the intereſt of farmers to lay it by. The culture of Coleſeed ſoon pays itſelf, the ſeed ſelling immediately for a good price, this would enable them to pay their rents without breaking in upon their ſtocks of corn.

Tranſplanted Coleſeed is liable to be many ways injured; ſcarcely has it taken root but the rabbits and hares will eat it down cloſe to the ſtalk, ſo that it is in vain to think of cultivating this plant where there is great plenty of game.

In ſome years the fly deſtroys the bloſſoms of the Coleſeed plants, if the field happens to be near a a wood, as ſoon as they are opened; but if a lucky rain falls it kills them: the latter bloſſoms knit, and there will ſtill be a good crop. If no rain falls on this occaſion, the plants muſt be given to the cattle,

tle, and the field be plowed up. This accident very ſeldom happens, if the Coleſeed is not ſown near a wood.

As Coleſeed ripens it ſhould be guarded by boys, or the pigeons, which are very fond of it, will deſtroy the greateſt part.

Such ſorts of game as feed on Coleſeed acquire the taſte of it; this is the reaſon that the game about Liſle is not much eſteemed. This food is ſtill worſe for pigeons, it gives their young ones a kind of ſcab, ſo that in Flanders they are not eaten in the Coleſeed ſeaſon.

Coleſeed is ſometimes attacked by the ſmut, particularly if it is tranſplanted on low grounds too much dunged, and ſubject to fogs. It is not known to be ſubject to any other diſeaſe.

In the neighbourhood of Clermont in Beauvoiſis, they let the Coleſeed ripen in the field where it was firſt ſown; but if they conſidered, that Coleſeed is not fond of moiſture, that it ſhoots forth large roots into the earth, and grows to a great height with numerous wide extended branches, they would be ſenſible that the land being covered with too many plants muſt be impoveriſhed, and that plants, which ſtand ſo cloſe together, cannot grow to their full ſize; thus, in this way, the land is impoveriſhed, the weeds are left to perfect and ſhed their ſeeds in it, and not only the crop of Coleſeed is very indifferent, but alſo the crops which ſucceed it.

In order to reſtore this land to a good condition, it muſt be well manured and fallowed.

Coleſeed extracts ſuch a quantity of ſalts from the earth, that the Flemiſh farmers tranſplant it, as well to divide betwixt two pieces of land the loſſes in point of quality it occaſions to the ſoil, as to procure better crops. For both theſe reaſons they alſo ſometimes tranſplant their Coleſeed on land newly broke up. In the country of Amiens they tranſplant their Coleſeed after the plough in cloſe furrows; this method is better than that laſt mentioned, but it is greatly inferior to the Flemiſh method, for the rows are diſordered, and the plants cruſhed by the horſes feet, and, having beſides no freſh earth laid on them, they cannot grow to be ſuch fine plants: and, on the other hand, the earth, which is not kept ſtirring, cannot receive any conſiderable benefit from the influences of the air.

There is however a caſe in which this method muſt be reſorted to, which is, when the plants are grown ſo tall and have ſuch long roots, that proper holes cannot well be made for them with a dibble, they ſhould be laid in the furrows after a plough, and open furrows or trenches ſhould be left at the diſtances I have already laid down; but the earth from theſe trenches is, with greater difficulty thrown on the beds, becauſe the Coleſeed in this method is planted lengthways, whereas, in the other method of tranſplanting, the plants croſs the beds.

I muſt ſay a few words more on the ſubject of theſe open trenches, and the caſting of the earth from them on to the beds; which is, that they ſupply the ſoil with an additional quantity of ſalts, ſweeten it, increaſe the depth of the upper bed, kill the couch graſs, and other weeds. The farmers in the neighbourhood of Liſle are ſo well perſuaded of the advantages reſulting from them, that after the Coleſeed is off the land, they form more trenches along the middle of the beds, that they may have finer crops of corn.

In the year 1755 I ſaw in the neighbourhood of Guiſe ſome Coleſeed tranſplanted into a field, containing about 18 acres, which had always borne fine corn, but had no great depth of ſoil.

At the depth of ſeven or eight inches lay a bed of red clay, which the farmers are ſo much afraid of mixing with their good earth. This land was firſt well dunged, and when the Coleſeed was tranſplanted, the red earth which came out of the trenches was thrown on the beds.

All the inhabitants of the country flocked to ſee this work executed, which was under the direction of a Flemiſh Farmer. They pretended that he ſpoiled the land, and that no corn would grow on it afterwards.

However, during the courſe of the winter, the red clay became mellowed, the rains, which waſhed the dung, ran into the trenches, carrying with it a ſediment and a portion of ſalts, improving the earth that was in the enſuing ſpring to be thrown on the beds amongſt the rows of the Coleſeed, which came on amazingly.

At the harveſting of the next crop, the inhabitants did not fail coming to ſee what ſort of corn ſucceeded the Coleſeed; and being perfectly well convinced, that it was much finer than the land was accuſtomed to bear, they laid aſide their prejudices, and adopted the planting of Coleſeed.

In the year 1761 there was in that ſingle quarter above 100 acres of tranſplanted Coleſeed.

I imagine it will be quite unneceſſary to uſe any farther argument, to make it evident, that the Flemiſh method is by much the beſt, not only as far as it regards the Coleſeed, but alſo with reſpect to ſucceeding crops.

It is uniformly practiſed in this country, where they have been attached to it time out of mind; whereas in other places, where this culture is as it were but lately introduced, every farmer has a method peculiar to himſelf, whence we may conclude, that the method which ſhould be univerſally practiſed is not yet ſufficiently known.

ARTICLE XXX.

Some Queries reſpecting the Sileſia Wheat, to which is added, a Compariſon of the Expences of its Culture and Produce with the Engliſh Wheat, contained in a Letter to the AUTHORS.

GENTLEMEN,

I HAVE read in the firſt part of your work, p. 80, an account of a ſort of Wheat which is there ſaid to grow in Sileſia; now if this account is true, which I have no reaſon to doubt, our good ally, the King of Pruſſia, would do us an eſſential ſervice if he would ſend us over a parcel of this corn to England, that we might try what ſucceſs we ſhould have in its culture.

Sileſia, as I am informed, for I was never there, is a fine corn country, and they ſay the farmers are intelligent, induſtrious, and of courſe warm.

I am very ſorry Mr. Dumeſnil Coſté did not give a more full deſcription of this Wheat, with which he ſeems to be well acquainted. He does not tell us whether it has awns, or is without beards, like the common Wheat.

Perhaps ſome of your readers or correſpondents may be able to ſupply his deficiencies, and to inform us farmers, who have never travelled ten miles beyond the limits of the county we live in, whether we have not in ſome part of England, Ireland, or Scotland, a ſort of Wheat of the ſame nature as that ſo much recommended by the above French Gentleman.

I find the beſt quality of this Wheat is its not being ſubject to the ſmut, which is indeed a fatal diſorder;

order; and I own this is a great advantage, and a powerful motive, to induce us to make a trial of it at leaſt.

The French Gentleman adds, that this Wheat is leſs apt to lodge, having a pith in the ſtraw, which makes it ſtronger.

This is alſo another advantage, becauſe the beſt crops are moſt ſubject to lodge.

As to what the Gentleman ſays about giving the ſtraw to cattle in the winter, as is the cuſtom of the Germans, it is but little worth our notice, for our cattle have generally better fodder in winter than chopped ſtraw; and, if I remember right, the public papers informed us, that laſt war very many of our Engliſh horſes were ſtarved to death by being fed with this German chopped ſtraw: but different countries have, they ſay, their different cuſtoms.

M. Dumeſnil Coſté ſays it yields larger returns than common Wheat; I wiſh he had mentioned the proportions of the ſeveral crops, we could then have judged for ourſelves; for if the crop of Sileſia Wheat ſhould only be a little larger, the badneſs of the quality of the bread made of it, will throw the ballance on the other ſide the queſtion.

We farmers have ſtill another reaſon to lament, that this Gentleman has not given an account how many more buſhels this Wheat will yield from an acre than the common Wheat. It requires, I find, a rich ſoil well prepared; it is not ſaid whether the ſoil ſhould be light or ſtrong; now a rich well prepared ſoil, of a good ſubſtance, is what we always prefer for our beſt Wheats; and according to all appearance it will not be worth while to ſow on ſuch land the Sileſia Wheat, eſpecially as more ſeed muſt be uſed than when common Wheat is ſown.

I ſhall now endeavour to form ſome compariſon betwixt theſe two ſorts of Wheat.

I will in the firſt place ſuppoſe the coſt of preparing the land for ſowing to be the ſame, ſo that I ſhall at this period begin my account.

I generally ſow on my good land (ſay) three buſhels of Wheat per acre; and let us allow half a buſhel more for Sileſia Wheat, each at ſix ſhillings the buſhel.

At harveſt my Wheat coſts me five ſhillings per acre reaping; for the Sileſia Wheat as being a thicker crop and more apt to ſhed, ſo that more care muſt be taken, we muſt allow ſix ſhillings per acre.

We will call the crop of an acre of common Wheat on good land thirty-two buſhels; and we will admit, that on the ſame land the Sileſia Wheat would yield thirty-ſix buſhels per acre, which is allowing a great deal.

I pay two ſhillings per quarter for threſhing, &c. my common Wheat; now for the Sileſia Wheat we cannot allow leſs than three ſhillings; the manner of ſeperating it from the ſtraw being ſo very peculiar, that I dare venture to ſay, the man who threſhes common Wheat for two ſhillings will earn a great deal more in a day, than if he undertook at three ſhillings to ſeperate the Sileſia Wheat in the manner above refered to.

I will next ſuppoſe, that my Engliſh Wheat ſells for four ſhillings and ſix-pence a buſhel; and as the Sileſia Wheat is confeſſedly of an inferior quality, making worſe bread, I ſhall allow that at four ſhillings the buſhel.

I omit to mention, that as the Sileſia Wheat is a larger bulk, it will in proportion coſt more carrying to market; becauſe, I will candidly ſuppoſe, that the increaſed quantity of ſtraw, chaff, and under corn will make nearly, if not totally amends for this difference.

I alſo admit any difference there may be in the expence of loading it and carting it home to the barn in harveſt, as this will not amount to any very conſiderable matter.

I ſhall proceed to make a compariſon betwixt the two accounts, that we may be able to judge on which ſide the ballance will be.

Expences of Common Wheat.

	£.	S.	D.
Paid for three buſhels of clean Wheat ſeed for ſowing one acre of land, at 6 s. - -	0	18	0
For reaping, &c. one acre of Wheat - -	0	5	0
For threſhing, &c. thirty-two buſhels of Wheat, at 2 s. per quarter - - - - - -	0	8	0
Total - -	1	11	0

Expences on Sileſia Wheat.

	£.	S.	D.
Paid for fourteen pecks of Sileſia Wheat, at 6 s. per buſhel - - - - - - - - - - - - -	1	1	0
For reaping one acre of the above Wheat, the crop being thick and apt to ſhed - -	0	6	0
Threſhing, &c. thirty-ſix buſhels of the ſame Wheat, at 3 s. per quarter - - -	0	13	6
Total of Sileſia Wheat - -	£2	0	6
Of Engliſh Wheat - - - - -	1	11	0
Difference - - - - - - - - - - -	£0	9	6

Produce of Common Wheat.

	£.	S.	D.
Thirty-two buſhels of Wheat, ſold at 4 s. and 6 d. per buſhel - - - - - - - - - - - - -	7	4	0

Produce of Sileſia Wheat.

	£.	S.	D.
Thirty-ſix buſhels of Sileſia Wheat, ſold at 4 s. per buſhel - - - - - - - - - - - - - - -	7	4	0
Difference - - -	£0	0	0

Thus we find then, that the difference in the expences amounts to nine ſhillings and ſix-pence; and that the difference in the ſum returned by the ſale is nothing, ſo that the farmer who ſhould grow one hundred acres of this Wheat in a year, inſtead of the common Wheat, would according to this account be near fifty pounds out of pocket.

I could have made a much wider difference, but I did not chuſe to exaggerate matters; and, if I am in this account wrong, I ſhould be glad if ſome of your readers or correſpondents would ſet me right.

My only motive for this letter, is to gain what real knowledge I can reſpecting the Sileſia Wheat; and I may add, that I ſhall ever be well pleaſed to guard my brother farmers againſt adopting too haſtily the culture of other ſorts of Wheat, than thoſe which are already in every reſpect well known, which beſides agree with our fickle climate.

If a farmer wiſhes to do ſervice to his country by improving huſbandry, let him, by all means, make ſmall experiments at firſt; if theſe ſucceed, it will be ſome encouragement for him to proceed, and he will be ſure not to hurt his circumſtances.

It is now time for me to conclude, with wiſhing ſucceſs to you, and all others, who endeavour to improve the ſtate of our national huſbandry.

I am, Gentlemen,

Your moſt obedient ſervant,

North of London,
March 2, 1765.

An Old FARMER.

ARTICLE

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ARTICLE XXXI.

An Eſſay on the beſt Method of making Butter, on the Management of a Dairy, and ſalting Butter for keeping or exportation. Written by Mr. Jore, *Secretary to the Society of Agriculture, eſtabliſhed at Rouen in Normandy.*

A Considerable trade for Butter being carried on in France, not only for the ſupply of the great towns in the kingdom, but alſo for the uſe of the colonies, it is natural that we ſhould contribute as much as poſſible to the perfection of this commodity; and this ſubject appeared to be of ſo much the more importance, as Normandy is capable of ſupplying a very conſiderable quantity of the beſt Butter, for it abounds with excellent paſtures, which maintain a great number of milch cows.

All the inhabitants of Normandy know the defects of the Butter they make, but few of them are ſenſible that theſe defects are leſs to be attributed to the quality of their milk, than to the manner in which they manage their Dairies.

One ſingle diſtrict is well ſkilled in this matter, and no other has benefitted by its example in the courſe of a great number of years.

By adopting the method practiſed in the country of Bray, which I am now about to deſcribe, our Butter would be delicious and good at every ſeaſon of the year, it would become a capital article of houſewifry, as it would be proper for ſalting, and would keep for years together: by this means it might become an article of commerce, in preference to Butter made in a different manner, and ſave large ſums of money to the kingdom, which are now ſent abroad to purchaſe this commodity, though of an inferior quality.

Obſervations made at Merval, on the Manner of making Butter in the Country of Bray.

THE milk is ſet in cellars arched over with brickwork, deep and cool, ſomewhat reſembling ſuch vaults as are beſt adapted to keeping wine in proper order. The temperature of the air in them in winter as well as ſummer, is nearly from eight to ten degrees of M. Reaumur's Thermometer. They are paved with ordinary tiles, or ſimply with bricks laid flat.

When there is any reaſon to apprehend the heat penetrating into the cellars, the vent-holes are ſtopped with ſtraw during the heat of the day.

In winter they take care that the cold ſhould not get into this cellar, by ſtopping the vent-holes in like manner in froſty weather.

The door to theſe cellars, and the vent-holes ſhould be either on the north or weſt ſide; the door is often within the dwelling-houſe, but always in a room where no fire is kept.

Neatneſs and cleanlineſs are ſo very eſſential in this cellar, that no wooden utenſils, boards, &c. are ſuffered to be in it, becauſe as theſe would ſoon rot in ſuch a cool place; a diſagreeable and muſty ſmell would iſſue from them.

Not the leaſt dirt is to be ſeen either on the roof, the edges of the air-holes, or on the floor; and in order to preſerve this neatneſs, the pavement is frequently waſhed; and no-body comes in without putting on a pair of ſlippers, which ſtand ready at the door.

The perſons who have the care of the Dairy put them on there, firſt pulling off their ordinary ſhoes;

the leaſt ſmell, other than that of milk, which ſhould be perceived in the Dairy, would be thought to injure the quality of the Butter, and would be attributed to the want of care in the maids.

Cleanlineſs is thought ſo extreamly neceſſary towards the having good Butter, that in Saxony and Bavaria, they rub and waſh the cows before they milk them, if they happen to have laid down in the cow-houſe.

The keelers in which the new milk is put, are earthen diſhes ſcalded in hot water, in order to get off the ſtale milk that may be ſoaked into their ſubſtance. This ſtale milk is an inviſible leaven, tho' well known, which ſours the new milk. Conſtant experience has diſcovered this inconvenience. Theſe diſhes are fifteen inches wide at the top, ſix at the bottom, and ſix inches deep. Theſe dimenſions are from outſide to outſide; if they were deeper it would be hurtful, if they were wider it would be inconvenient.

The milk is brought from the paſtures in the wooden pails or earthen pans, in which it was milked.

All copper veſſels are eſteemed dangerous to be uſed in a Dairy. The milk is ſuffered to remain quiet about an hour on the Dairy floor, till the froth is gone off, and the natural heat it had has quitted it. It is then poured into the diſhes through a ſieve, ſo that no cow hairs or dirt may remain in it.

The diſhes are ſet on the floor of the Dairy, after it has been will cleaned; the coolneſs of the place communicates itſelf to the diſhes, and prevents the milk from curdling; for every thing that is done in the Dairy, is in order to hinder the milk from curdling and growing ſour in ſummer before the cream is taken off; and in the winter to prevent the Dairy from being ſo cold, as that the milk ſhould be frozen, or that the Butter ſhould be with difficulty made, on account of the cream having been chilled.

The diſhes being in this manner filled, are twenty-four hours, and ſometimes leſs on the Dairy floor; they are then ſkimmed; they ſhould not be left longer, becauſe the cream would loſe its ſweetneſs, becoming thick, and the milk under it might curdle and grow ſour; and where this is the caſe, no good Butter can be expected.

The ſkimming is performed in the following manner.

The maid gently raiſes the diſh, laying the lip of it on a large pan, and with her finger's end, ſhe divides the cream near the lip of the diſh, in ſuch a manner, that the milk which is underneath, may be poured off into the great pan through this diviſion, leaving the cream by itſelf in the diſh.

All the diſhes which were ſet at the ſame time, are in this manner at the ſame time emptied, and all the cream is put together in proper pans, in order to be churned at the appointed hour.

At the time of the year when it is neceſſary to milk the cows three times a day, this work is to be three times a day repeated, when the milk has been ſet in the diſhes twenty-four hours.

It is neceſſary to obſerve, that the diſhes being only ſix inches deep, the cream riſes much ſooner to the ſuperficies, and is generally all riſen in about eighteen or twenty hours, particularly when the coolneſs of the air in the Dairy, prevents the milk from curdling.

If the weather is tempeſtuous, very hot, or inclines to thunder, the cream riſes a great pace, and the milk will quickly curdle and grow ſour, but this muſt be prevented thus; as ſoon as the Dairy-maid hears the thunder at a diſtance, ſhe runs to the Dairy, ſtops up the vent holes, cools the pavement by throwing down ſome water, and then ſkims all the diſhes wherein the cream has riſen a little.

In ſome extraordinary caſes, the cream riſes in leſs than twelve hours.

When the milk is thus drawn off from beneath the cream by ſtooping the diſhes, within the ſpace of twenty-four hours at fartheſt, the Butter-milk which is in the cream is not in the leaſt ſour, and the ſame may be ſaid of the ſkimmed milk. This laſt being then a very thin liquid, no part of it remains in the cream, ſo that there will be no danger of the cream ſouring in four or five days whilſt it is kept in the Dairy before it is churned.

They who are acquainted with the manner in which Dairies are managed in Upper and Lower Normandy, may eaſily judge that their diſhes, which are above as large again as thoſe made uſe of in the country of Bray, cannot be cooled like theſe latter; that the cuſtom they have of pouring the warm milk into them, abſolutely defeats the intention of keeping them cool; that the cream cannot riſe to the ſurface of theſe large diſhes, ſo quickly as to be taken off before the milk beneath is ſour; that the cuſtom of leaving theſe large diſhes expoſed to all varieties of heat and cold, though either may be in extreme, without taking the leaſt care to guard againſt the natural bad ſmell, or dirtineſs of the place, are ſtill more oppoſite to what ought to be done; and finally, that to leave the milk to grow ſour and curdle, ſkimming it only once in five, ſix, or even eight days, and ſometimes more, are cuſtoms which tend to ſpoil both the milk and the cream, inſomuch that no good conſequences can reſult from them.

Common experience convinces us, that the acid parts deſtroy thoſe which are more fat, and of greater ſubſtance, and that they give the conſiſtence of ſoap, to what they do not reduce to water; it is alſo well known in the country of Bray, that the cream taken off whilſt it is light, new, and ſweet, from milk that is alſo ſweet, yields a larger quantity of Butter, in proportion, than when it is taken off ſtale, from curded, ſour, old milk; the Butter in this laſt caſe, is not only in ſmaller quantity, but it is more rank, cannot be kept freſh, and is by no means proper for ſalting, which is the principal object of this Eſſay.

I know ſeveral diſtricts in this province (Normandy) where the Butter is good and fine flavoured in ſpring and autumn, but rank and bad in ſummer, becauſe the coolneſs of the ſpring and autumn, has nearly the ſame effect on their Dairies, as the inhabitants of the country of Bray, induſtriouſly endeavour to cauſe the whole year round. But when the ſummer advances, the ſourneſs of the milk ſpoils the Butter, and makes it of no value, though their paſtures are excellent.

We may reaſonably conclude, that if they had better management, they would not loſe the advantages they might naturally expect from the fine weather of the ſummer, when the graſs is infinitely better, and more plentiful.

I know a farm, the chief profit of which ariſes from Butter; this farm, when occupied by intelligent and ſenſible people, yielded Butter which ſold for the ſame price, as the beſt made in the country of Bray; the land, however, coming into the hands of a farmer who knew but little of this matter, and whoſe wife was full fraught with the prepoſſeſſions ſhe had learnt in the country of Caux, and which ſhe exactly followed during the nine years of the leaſe, the Butter made in that time, was conſtantly ſold for the worſt ſort, at a third part leſs price than his neighbours, and neither the remonſtrances of the landlord, nor the loſs ſhe every week ſuffered, could ever perſuade this woman to alter her method.

For eight years paſt, this ſame farm has been in the hands of a new tenant, an induſtrious intelligent man, who adopting good methods, the Butter he made, was immediately eſteemed the beſt in the country, and is conſtantly ſold at a price accordingly, in the market at Gournay.

To this farmer am I obliged, for the deſcription of the management of a Dairy which I am now giving.

This anecdote proves, that the advantage of this method, by no means depends on the ſoil, though it be ever ſo good.

All the milk that is ſkimmed, muſt immediately be taken out of the Dairy, leſt it ſhould in any way injure the cream, but this latter is kept four or five days, or even a week, before it is churned; but it is at the ſame time to be obſerved, that the leſs time the cream is kept, the finer flavoured will be the Butter that is made of it.

In extenſive farms, where the quantity of cream is too large to be managed in common churns, they uſe a barrel churn.

One of theſe conſiſts of a barrel about three feet long, and two feet and one half in its largeſt diameter, the whole meaſured from out to out. On each head is an iron ſpindle, faſtened on with a croſs to the head, and on each ſpindle is a winch.

The ſpindles reſt on a horſe or ſtand, made on purpoſe, of ſuch a height that the women may eaſily turn the churn.

The iron croſſes by which the ſpindles are faſtened to the heads of the barrel, prevent there being any neceſſity of an axis paſſing through it, as there muſt be no iron within ſide the barrel. The winches are made three feet long, that two, or even three people may work at each, when the quantity of Butter in the churn requires it.

Within the barrel are two boards, faſtened edgeways, one on each ſide the aperture hereafter mentioned, to the ſtaves, and running the length of the barrel on that edge, but on the other edge they are chamfered off at the ends, in order to permit the liquid part to paſs eaſily whilſt the churn is turning.

One hundred pounds of Butter at a time, may be made in a churn of this ſize; there are larger, and ſome on the contrary are leſs; in other reſpects, it is not much matter in what inſtruments the Butter is made, provided there is no intermiſſion in the making. The barrel churn is uſed for greater expedition, where a large quantity of Butter is made at a time, and any inſtrument that will accompliſh this end, may indiſcriminately be made uſe of.

The cream being put into the churn, the aperture which ſhould be at leaſt ſix inches wide, is to be cloſed with a plug, covered with linnen dipped in a lye, which I ſhall deſcribe by and by, and ſecured by an iron bar. Over the bar paſſes an iron pin, which being driven into two ſtaples faſtened to the barrel, makes every thing ſecure.

Four or ſix people turn the churn, till the Butter is made, which will be in one hour in ſummer, but in winter will require ſeveral hours; this work does not coſt much, for the farmer's maids are helped by ſome poor women in the neighbourhood, who have only a little Butter-milk given them for their trouble.

It is very evident, that the motion of the churn, continually agitates the cream, for every turn it falls twice from one board to the other, and they know when the Butter is made, by its falling in a lump. The Butter-milk is then drawn off through a hole about an inch diameter, on one ſide the large aperture, which hole had, during the operation, been ſtopped by a wooden plug.

Through this hole, a pail of cold water is poured, by means of a funnel, and the plug being again put in, they continue turning the churn, to waſh and cool the Butter. This work is three times repeated, if they would have it well cleaned, and it is left ſeveral hours to cool in the laſt water, that it may be the firmer, if the weather is very hot.

When the Butter is ſufficiently cooled, the great plug is pulled out, and the Butter is taken with the hand from the churn, in pieces of two or three pounds weight each, of which lumps of different weights are made, to fifty pounds, by heaping it in a cloth purpoſely dipped in lye.

The largeſt lumps are moſt eſteemed, becauſe they keep better in carriage.

They mark the lumps with wooden ſpoons, and notched ſticks, in order to decorate them.

In winter, Butter having no colour, the natural paleneſs of it is diſagreeable to the ſeller, to the buyer, and much more ſo to the conſumer.

They have diſcovered a method of giving it the colour that is natural to it in ſummer, without injuring the quality of the Butter, or infecting it with any taſte whatever.

They get a large quantity of Marygold flowers; either double or ſingle are equally good, provided they are freſh gathered.

Theſe are put into a ſtone pot as faſt as they are gathered, and being preſſed down, the pot is covered and ſet into the Dairy.

After ſome months, all theſe flowers are converted into a thick liquid, of the colour of a Marygold flower; this liquid they uſe in winter, to colour their butter; they mix a ſmall quantity of it with ſome cream, which they put into the churn when they fill it.

Experience teaches them to put the neceſſary quantity, according to the fulneſs of the colour they would give the Butter.

This colour is laſting, for the Butter never loſes it. Marygold flowers, which give it no bad quality, are known to be alexipharmic and ſudorific, but the ſmall quantity that is put into Butter, has no ſenſible effect.

Of the neatneſs and cleanlineſs required in making BUTTER.

Butter is not only apt to ſtick to what is not very clean, but alſo to every thing that has been waſhed well, or even ſcalded with hot water, if it is not firſt rinſed with lye, made of fine aſhes, or of Roman nettles bruiſed till they no longer ſting; the laſt are generally uſed, and every time a pan, cloth, or other utenſil, has been employed in the Dairy, either for holding milk, cream, or Butter, they ſhould be rinſed in this lye, before they are again uſed: and moreover, the miſtreſs, who is generally the perſon that makes up the Butter, and takes it out of the churn, is obliged to rub her hands and arms with this lye, or the Butter would ſtick to them.

Of the Uſes to which the Skimmed Milk, Butter Milk, &c. are applied.

The poorer kind of people drink the Buttermilk, which is taken out of the churn by way of food; they alſo make broth of it in the farmer's houſe for the men and maids, and moiſten bran with it to feed the poultry, &c.

The ſkimmed milk they give to their calves, warm, mixing half water with it. This milk being very thin in body, as the more ſubſtantial and nouriſhing part is taken away from it, often gives the calves a weakneſs, of which ſeveral formerly died; but they are preſently recovered, by letting them ſuckle their mother's, which ſoon reſtores them to their ſtrength and vigour. This remedy is, however, expenſive, as it deprives the farmer of the Butter, which would be produced by the cows milk.

They ſay, that if the ſkimmed milk was half mixed with water, in which turneps, parſneps, or any ſweet and nouriſhing roots had been boiled, the animals, ſo far from contracting a weakneſs, will grow fat, the juice of theſe plants in ſome ſort, ſupplying the place of the fat parts of the milk which are taken away.

I am of opinion, this method might without any riſk be tried; but it is neceſſary to take notice to the country people, that in general, they uſe copper veſſels to heat the milk which they give to their calves; the copper of theſe veſſels depoſits in this milk, which is naturally inclined to be ſour, on account of its being deprived of its more oily parts, a corroſive quality, capable of injuring young calves, and even killing them.

It would be much ſafer, if earthen veſſels or iron pots were uſed, as theſe communicate no bad qualities.

As to ſuch of the ſkimmed milk as the calves do not conſume, it is curdled by art as ſpeedily as poſſible, leſt it ſhould turn ſour; ordinary cheeſes are made of it, which are uſed in the farmer's own family, or ſold to the poor; finally, the whey which is preſſed out of theſe cheeſes, with the ſkimmed milk that is not applied to this uſe, ſerves to feed the pigs withall.

Of the Method of SALTING BUTTER.

Our endeavours ſhould tend towards making Butter fit for ſalting, as by that means it may become an object of commerce, either in the interior parts of the kingdom, the other countries of Europe; or, finally, for the parts beyond the tropic.

The method we have deſcribed gives to Butter the qualities neceſſary for its preſervation, but it muſt be ſalted enough to make it keep, which depends on the quality and the quantity of ſalt that is uſed, the veſſels in which the ſalted Butter is put, and ſome other circumſtances.

The farmers, not being accuſtomed to ſell their Butter ready ſalted, they carry it to the markets of ſuch towns where there is the greateſt conſumption: there every one buys the quantity of Butter that is neceſſary for his family The buyer diſtinguiſhes that which has the qualities of the Butter made in the country of Bray, from that made in the manner of the country of Caux; he ſets a value on one and rejects the other, which is ſpent freſh in the neighbourhood where it is made.

Butter ſhould be ſalted as ſpeedily as poſſible, every delay being prejudicial. It is ſeveral times to be waſhed till the water is no longer diſcoloured. Grey or bay ſalt ſhould be uſed, and not white ſalt, which is not eſteemed good for preſerving any thing.

The bay ſalt is to be dried in an oven and bruiſed; the waſhed butter being then ſpread out, an ounce of the dried and bruiſed ſalt ſhould be ſprinkled on for every pound of Butter: it ſhould then be kneaded till the ſalt and the butter are well incorporated together.

The ſalted butter is afterwards put down into ſtone crocks or jars of various forms. The jars ſhould firſt be ſcalded with boiling water, to get out the ſtale butter which ſoaks into the pores of the earth of which they are made, they are then to be rinſed with lye, in the manner above preſcribed for the dairy utenſils.

Theſe jars hold from twenty to thirty pounds; the ſalted Butter is to be preſſed down in the jars, and they are to be filled within two inches of the top, after which they are to remain quiet for ſeven or eight days.

In this time the ſalted Butter detaches itſelf from the jar by ſhrinking in its ſize, and leaves between it and the jar a ſpace of about a line wide, into which the air would inſinuate itſelf, and ſpoil the Butter if it was ſuffered to remain in that ſtate.

In order to prevent this a brine is prepared, made of ſalt and common water, which muſt be ſtrong enough to bear an egg, as there would be danger in making it too weak.

This brine being ſettled, the clear part is drawn off, and is poured on the ſalted Butter, ſo as to introduce itſelf into the vacant ſpace between the butter and the jar, and thence expel the air as faſt as it gains admittance; for this purpoſe it is poured on by little and little, gently moving the jar, till the brine is at leaſt an inch above the butter. The air cannot, after this is done, approach it on any ſide, unleſs the butter floats in the brine. In this caſe a weight muſt be laid on it, in order to ſink it, and thereby prevent the air from cauſing it to decay.

This is the method of ſalting Butter, which we practiſe all the year round at Rouen: it is uſed in the beſt families, and ſerves to make paſtry, which the moſt delicate palates cannot but approve of.

All Butter ſalted in this manner, and put down in ſtone jars, with a ſufficient quantity of brine, will be equally good with that of the country of Bray, which we have deſcribed; for the keeping well of the Butter depends on its not having been injured by the acidity of the ſour milk, and on the jar being made of good earth, and its being well ſcalded and rinſed, as we have recommended, with the lye, ſo as not to communicate any bad quality to the Butter.

When this commodity is to be carried to any diſtance, the brine cannot be kept in the jars; to ſupply the place of it therefore, they cover the Butter with ſalt to the thickneſs of an inch.

This method does very well, provided the Butter is not long without brine; inſomuch that Butter, properly made, and which after being ſalted, is carried into the ſeveral parts of Normandy, and even to Paris, if brine is but put on it when it comes there, will be very good.

But this will not do for Butter intended for exportation or ſhips proviſions. It is very difficult to ſtow any conſiderable number of jars on account of their being ſubject to break; hence came the cuſtom of putting up Butter in firkins or tubs: but whether it is put into firkins or jars, it is impoſſible to keep it covered with brine if the ſhip paſſes the tropic.

In order to remedy theſe inconveniences it will be proper to ſeaſon the wood, of which the Butter tubs are made, to keep it from ſhrinking, and from the fermentation to which it is ſubject in hot climates, when the tubs are greatly heated in the hold, at which time the ſap ouſes from the wood, mixes with the Butter, and makes it rank, notwithſtanding it has been well ſalted. The ſame fermentation alſo leſſening the volume of the ſtaves, the brine runs out, and the Butter is ſoon ſpoiled.

It is not impoſſible to find a remedy for this, and to do it would certainly be of infinite uſe, as it would probably be a means of making all ſorts of ſea proviſions keep better, which would greatly contribute to preſerving the life and health of ſailors, an object of no ſmall importance.

In order to preſerve Butter on ſhipboard, it ſhould be well put down in jars, ſhaped like a fruſtrated cone the baſe uppermoſt, or rather like a perfect cone, the baſe uppermoſt, out of which the Butter might eaſily be taken in a ſingle lump.

The lump of Butter being covered on the outſide with ſalt, and then preſſed down into its jar, might in this condition do without brine, becauſe the jars reſting on the point of the cone, the lump of Butter would ſink towards the bottom as faſt as the ſize of it might be leſſened by the heat of the hold; by this means there would never be any vacant ſpace, except on the top, which ſhould be covered with ſalt.

Wooden tubs might be made in the ſame form, ſo as to anſwer the ſame purpoſe, provided the wood they were made of was well ſeaſoned; but the greateſt pity is, that theſe tubs could not be conveniently ſtowed in a hold.

In general the paſturage of the greateſt part of Normandy ſeems to ſurpaſs that of the country of Bray, if we may be permitted to judge by the nature of the ſoil, and the dung that is left by grazing animals.

If any means could be diſcovered, by ſome encouragemens given, of introducing a good method of making Butter into ſuch parts as now make ſo wretchedly bad, the ſalt Butter which comes to Rouen from Iſigny, and other parts of Normandy, would not be entirely abandoned to the conſumption of the poor.

If this was the caſe we may preſume, that Butter would become a capital object in commerce greatly to the advantage of thoſe who poſſeſs extenſive paſtures; for even at this time there is not a cow but what brings forty ſhillings clear profit to its owner, after all expences are paid, putting entirely out of the queſtion the great encreaſe of profit that might be expected from dealing in Butter of a ſuperior quality, fatting calves, and even the cows.

It is well known, that fattening oxen does not bring ſo large a profit to the graziers by far; whence we may conclude, that it would be very advantageous to farmers if they kept more milch cows.

This advantage would ſubſiſt till the quantity of Butter made was in proportion to the demand; and even afterwards it would always continue a capital branch in agriculture, as it would keep us from the neceſſity we now are under of purchaſing ſuch quantities of foreign Butter.

I have been by ſo many perſons requeſted to write this Eſſay, and by ſuch as are ſeemingly eager to adopt the methods preſcribed in it, that I am in hopes its utility will in time be felt not only by the dairy-man, but alſo by the farmer and the land-owner.

ARTICLE. XXXII.

An Eſſay on the planting of the reſinous Pine Tree, on the ſeemingly barren Parts of the Royal Foreſts, on ſandy Plains and Heaths, compiled from the Papers of the late Mr. Rondeaux, *of Rouen in Normandy.*

THE conſumption of fire-wood, in the city of Rouen, is ſo much increaſed, that the inhabitants are with great difficultly ſupplied with a ſufficient quantity of it.

This important object engaged the attention of M. Pecquet, Intendant-general of the foreſts, from the inſtant he was appointed to that office. He endeavoured to find out the means of making ſome advantage of 3000 acres of land in the foreſt of Rouvray, which were not of the leaſt uſe.

The plan he had for this purpoſe laid, was ſeconded by an arrêt of the council, dated February 17, 1750, which ordered four hundred acres of this land to be replanted with birch-trees, and 300 more to be planted every ſucceeding year.

The ſucceſs it has had, has ſufficiently proved the propriety of the ſcheme; and we may even ſay, that it has ſurpaſſed the hopes that were entertained from it; for in the winter 1756, they were obliged to cut the 400 acres planted in 1750. The produce of this cutting was as large as could be wiſhed; but notwithſtanding the care that was taken in making theſe plantations, all parts did not ſucceed alike. The ſoil is ſo very dry in ſome quarters, that though the greateſt diligence was uſed to ſupply the places of ſuch plants as died; yet after all, ſome ſpots remained bare.

M. Roudeaux, who for near twenty-eight years, had by the office he enjoyed the care of the foreſts about Rouen; undertook the ſuperintendence of all this work.

He made it his particular ſtudy to find ſome method of again ſtocking this whole tract with wood.

The experiments he made, and the inſtructions he received from various parts, convinced him that this might effectually be done, by planting the reſinous Pine-tree in ſuch parts as were incapable of bearing any other tree.

The truth is, all the inſtructions he received agreed in one point; namely, that the moſt ſandy and dry ſoil was beſt adapted to the growth of the Pine-tree.

In order to compaſs this end, without breaking up the ſoil, and preparing the land as if corn was to be ſown; ſome very freſh ſeed of the Pine muſt be procured, which ſhould be ſown in the months of February or March; as to nurſeries they are entirely out of queſtion, for Pines will not bear tranſplanting.

M. Roudeaux having received theſe inſtructions from the country of Guyenne, the heaths of Bourdeaux, and the ſandy ſoils about Olonne, was willing to try what ſucceeſs he might hope in the affair.

For this purpoſe, in the year 1756, he got ſome new Pine ſeed from Bourdeaux. His principal experiments were made in two places, where the ſoil ſeemed but little adapted to bearing wood; one was in the foreſt of Rouvray, and the other in the eſtate of Madrillet, which is contiguous to it, and where the proprietors gave him leave to break up twenty-five or thirty perches of land.

The ſeed came up very well; the Pine-trees are very thick, and experience has convinced M. Rondeaux that the worſt ſoils, and ſuch as are abſolutely eſteemed good for nothing are beſt ſuited to this tree.

The utility of Pine-trees is well known; and, indeed, they are ſo generally uſed, and ſo neceſſary, that but for this reſource, half the province of Guyenne would be uninhabitable. They make of them vine props, laths, maſts, and yards; they uſe them alſo for building, and for all ſorts of carpenter's work.

When they are twenty years old, they begin to notch them, in order to extract the gum or reſin, of which they alſo make much oil of turpentine and pitch; this is continued for twenty years. The reſin alſo makes candles for the common people. One man may take care of four or five thouſand trees, which will yield 100 or 120 quintals of reſin yearly.

When theſe trees produce no more reſin, they are burned to make pitch and tar for caulking and paying ſhips bottoms.

The wood, when it is dry, burns very well, and the bark being ſtripped off, is proper for tanning; the wood may alſo be burnt into coal, the blackſmiths find that the iron works better with that than with ſtronger fuel.

Many people have conſulted Mr. Rondeaux, with reſpect to the advantages that may be made by planting this wood; in conſequence of which they made ſeveral experiments, which convinced them of its utility, ſo that there is not the leaſt doubt but that in a little time all the heaths, dry commons, barren hills, and other poor lands will be ſtocked with this wood, which could not fail being every way productive of great advantages.

All this might be done with very little expence either of time or trouble, for the Pine tree requires no culture, as it will ſow itſelf; and the firſt purchaſe of the ſeed will amount but to a trifle.

[It ſhould ſeem from the above eſſay, that the Pine tree would thrive well, and might, to great advantage, be planted on Hampſtead-heath in Middleſex, the ſoil of which is very ſandy, and turns at preſent to but little account. Putney-common and Wandſor-common might alſo be planted with Pines, which places being ſo near the metropolis, the timber would be of great value, not only for maſts and yards for the ſhipbuilders, but alſo for building. A great deal more land in the counties of Middleſex, Surry, Kent, Hertfordſhire, and Berkſhire, all convenient for the metropolis, might to advantage be planted with Pines.]

ARTICLE XXXIII.

An Account of an Experiment of ſowing Lucerne on a Stubble, made by M. Tschiffeli, *Vice Preſident of the Œconomical Society at Berne.*

I have hitherto been of the opinion generally received, that Lucerne requires a ſoil well manured, and properly prepared, a conſiderable time before the ſeaſon of ſowing; but as I have made it a rule, never to adopt any thing in matters of agriculture which I know not to be true, either from my own experience or from that of others, whom I know to be intelligent and of veracity, I laſt ſummer, 1763, made the following experiment.

I had a field containing ſomewhat more than an acre, the ſoil of which I knew to be excellent, being neither too ſtrong nor too light. After having been well plowed and manured, it had this year yielded a plentiful crop of wheat without any mixture of weeds.

All theſe circumſtances put together induced me to imagine, that I might, with ſome probability of ſucceſs, ſow Lucerne upon this ſtubble.

What farther encouraged me in this attempt was, the knowledge I had that this ſoil, of a middling nature, that is neither too ſtrong nor too light, was continued to the depth of about five feet.

As ſoon as the ſheaves were carried off, I cauſed this field to be plowed in narrow furrows as deep as poſſible. The ſmall portion of darnel that was mixed with the ſtubble was then picked out, and the clods well broke.

Finally, the land was laid very level with a heavy iron-tined harrow, after which fourteen pounds of Lucerne ſeed were ſown broad caſt, on the 11th day of Auguſt, in calm weather, and the ſeed was covered by means of a light harrow. A mild rain, which fell two days afterwards, greatly conduced to the ſucceſs of my experiment.

At the end of nine weeks the young Lucerne plants were a foot in height, equally thick in all parts of the field; and ſome good judges allowed, that they were as fine as any reaſonable man could wiſh.

I ſhall not, however, this autumn venture to cut it, being of opinion, that in order to ſtrengthen the roots it will be beſt to let the plants rot on the ground, and to cover them till ſpring either with ſtraw or long dung.

The event will ſhew how far I am in the right, and I ſhall not fail, in due time, communicating it to the public.

[If this Gentleman's experiment ſhould meet with ſucceſs throughout, it will be a great inducement to farmers ſowing Lucerne, as what in general deters them is the great expence of preparing the land for the reception of the ſeed. If, however, this uſeful plant can with any probability of ſucceſs be ſown after corn on a ſingle plowing, it muſt be deemed a great improvment; but we muſt remark, that if the Engliſh farmer means to ſow it after wheat, he muſt ſow his corn early that it may be early ripe.]

ARTICLE XXXIV.

An Experiment to make Lucerne thrive in a poor Soil without Manure, by the ſame Gentleman.

I cauſed the turf of a worn out paſture, containing about half an acre of land, to be raiſed with a paring plough. When the turf was half dry, it was piled up in litttle heaps, about two feet high. Each heap was then ſet on fire with the help of ſome faggots and dried peat turf. They were then covered, and the turf, in this manner, inſenſibly mouldered. This is by much the beſt method.

The aſhes of the burnt turf were afterwards ſpread as equally as poſſible over the ſoil, and the whole piece was dug at leaſt a foot deep.

After being laid level, the Lucerne ſeed was ſown and harrowed in.

Though this land was far from being of a good quality, having a mixture of a whitiſh clay, yet the Lucerne proſpered very well during the whole ſummer.

The ſeeds of the darnel were burnt by the fire, ſo that the crop was not injured by this weed, and I had two cuttings laſt ſummer.

This method may then probably be of great advantage to ſuch farmers as have lands of a like quality; but as this work requires time, and is more expenſive than where the turf is not to be burnt, I will not venture abſolutely to recommend this practice, particularly as I am not yet certain whether this piece, though it has proſpered ſo well hitherto, will continue to do ſo for any length of time.

FOREIGN ESSAYS, &c.

NUMBER IV.

ARTICLE XXXV.

To the AUTHORS *of the Foreign Eſſays on Agriculture and Arts.*

GENTLEMEN,

I Now mean to fulfill the promiſe I made you in my laſt letter by encloſing a curious eſſay written by Mr. Engel, of Switzerland, on the famous queſtion of the Nouriſhment of Plants by the ſame, or by various kinds of ſap. I beg leave to recommend this to your notice, and requeſt that you will afford it a place in your work as ſoon as you conveniently can. *I am, Gentlemen,*

London, April 16, *Your very humble Servant,*
1765. R. BRENNAN.

An Eſſay on the Queſtion, whether all plants extract from the earth the ſame nutritive juices. Written by Mr. ENGEL, *Preſident of a Committee of the Oeconomical Society at Berne.*

EUROPE, aſtoniſhed at the immenſe trade of the Engliſh, at their ſucceſſes, their power, and their wealth, has at length enquired into the cauſe of this ſuperiority, and it was immediately diſcovered, that this proſperity was chiefly owing to the encouragements given to agriculture in all the three kingdoms.

Some zealous citizens, either ſeparate or united in ſocieties, have applied themſelves to the ſtudy of the principles of this moſt uſeful art. The government, the parliaments have protected them by regulations, and encouraged them by rewards; and theſe united efforts have ſecured to this nation advantages which are greater, more certain, and more laſting, than thoſe derived from the mines of Peru.

Other nations, encouraged by this example, were willing to come in for a ſhare of theſe advantages. Academies were in every part eſtabliſhed, and we had the pleaſure of ſeeing learned, curious and induſtrious men, who, ſupported and encouraged by the princes and magiſtrates, made experiments, propoſed ſchemes, and eſtabliſhed rules for extracting from the earth, our common mother, every kind of production. And theſe philoſophical huſbandmen have been the rather induced to write on theſe ſubjects, by the delicacy of their ſentiments, perceiving the advantages that would reſult to mankind in general from their endeavours; and they moreover continually find, in the ſtudy of nature, reaſons for exalting the infinite wiſdom of the creator, and a variety of knowledge capable of ſatisfying their extenſive deſires.

It may eaſily be conceived how vaſt the field is, from the queſtions which have been publiſhed by our Society.

One of theſe queſtions is indeed of the laſt importance, though intelligent huſbandmen are much divided in their opinions relative to it. The queſtion is, Whether all plants require the ſame kinds of juices, of ſalts, of food; or whether each is nouriſhed by a different ſubſtance.

Mr. Du Hamel, who puts this queſtion, gives no poſitive anſwer to it; others are for the affirmative, many for the negative.

I will not venture abſolutely to decide in this matter. I ſhall content myſelf with propoſing my doubts, leaving my obſervations to be examined and judged of by the intelligent reader.

Be it as it may, the negative appears to me moſt conſiſtent with experience; and I think I have obſerved, that a ſoil which is exhauſted of the nouriſhment adapted to certain plants, is not ſo with reſpect to others.

I ſhall begin with laying down a few principles.

First Principle. The ancients have eſtabliſhed four elements, Fire, Air, Water, and Earth. Des Cartes propoſed three others, which, on account of their novelty were at firſt received, but were ſoon afterwards dropped.

Chemiſts who are employed in ſearching for the elements or principles of which various bodies are compounded, have in general ſpecified three, namely, Salt, Sulphur, and Mercury. Others have added two more, Phlegma and Caput Mortuum, which laſt ſome call Earth.

Others again exclude Mercury, which they ſay is nothing more than dilated Sulphur.

We know what is meant by Salt. As for Sulphur, they mean by it the oily and phlogiſtick or inflammable particles. By Mercury they mean the ſpirituous particles. I do not ſee how theſe two laſt principles can be confounded and identified, they rather appear to be oppoſite. In analyſation the ſpirit and the oil do not mix, but always remain ſeparate. The Phlegma is pure Water diveſted of all the other elements; and the Caput Mortuum is an earth diveſted of and detached from all the other principles.

Such as admit of only three principles, and the others who allow of five, appear to me to differ only in expreſſion. The three firſt are the only active principles, the two laſt being merely paſſive.

If then we will admit into the rank of chemical principles only active and efficient cauſes, there will be but three; but if we reflect that every agent is uſeleſs unleſs it has ſome recipient, ſome paſſive ſubſtance on which it may act, we muſt acknowledge, that the two paſſive principles are as neceſſary as the others, and equally merit a place amongſt the elements.

Second Principle. There is undoubtedly a very great analogy between animals and plants. Formerly the animal was thought to be as far removed from the vegetable kingdom, as this laſt is from that of minerals.

For a long ſeries of time what was ſaid relative to the Palm or Date tree was eſteemed a fable, namely, that there was a male and female, and that the aſſiſtance of the male was neceſſary to fecundate the female. How were they ridiculed who firſt diſcourſed of the fecundation of plants by the duſt of the male flowers, but at preſent nobody entertains the leaſt doubt of it.

The celebrated Linnæus points out to us an infinite number of different ſexes more amongſt plants than amongſt animals. He deſcribes their various conſtructions, he ſhews their farina fecundans, their ova, their receptacula, &c. inſomuch that it can henceforth never be denied, but that there is a great reſemblance between animals and vegetables. This is a principle of which we ſhould never loſe ſight.

Third Principle. There is an infinite variety amongſt plants; they all differ much in their ſtructure and in their compoſition. The ſtems are more or leſs ſucculent and ſoft, hard and ligneous, compact and porous, pliant and ſtiff. The fruits vary in ſhape, taſte, ſmell, and colour; the leaves are alſo very various. The diverſity is ſtill greater in the flowers, where all imaginable colours, ſhades, and mixtures are ſeen. The juices in the plants are not leſs different: we find many of them wholeſome, others hurtful, and ſome even poiſonous. In ſome plants vitriol predominates, in others nitre, in ſome ſulphur, in others ſalt. Some again contain all theſe various principles in a more equal proportion.

Fourth Principle. Nitre and nitrous particles contribute much to the fertilization of the earth.

I am ſenſible that this principle is not univerſally adopted. There are Naturaliſts who aſſert, that all ſalts being compoſed of ſharp and cutting particles, and being very ſuſceptible of moiſture, in no ſort contribute to vegetation, but by dividing, dilating, opening, breaking, and ſtirring the earthy particles, and inſinuating themſelves into the pores of the earth.

Others go ſtill farther, and contend that nitre, and particularly common ſalt, rather contribute to make land barren than fruitful. An effect ſay they ſo well known by the ancients, that when any town was marked out for deſtruction, they razed it, plowed up the ground it ſtood on, and ſowed it with ſalt; giving us thereby to underſtand, that the ſpot was neither to be inhabited nor cultivated, and that it was not for the future to bear even a plant.

In theſe various opinions we find both true and falſe poſitions; we will endeavour to diſtinguiſh them.

In the firſt place it is certain, that nitre uſed in exceſs is prejudicial to plants.

The garden belonging to the caſtle of A. is a terras, and the caſtle itſelf ſtands on a ſtill higher terras. At the end of one of the wings, where the ſtable is ſituated, is a border. This ſtable, though it is often cleared, abounds always with ſalt-petre, which deſcends and penetrates into the earth.

Though this border was in a fine expoſure nothing would thrive in it. I cauſed the earth to be taken away, and ſome freſh mould to be put in the ſtead of it. The plants then proſpered very well in it. Two years afterwards they all died, on account of the nitrous particles which were now found there in too great plenty.

Another experiment. I cauſed ſome pots to be filled with mould, which I imagined very good; the plants I put in them languiſhed and died. I was entirely ignorant of the cauſe, till having watered them ſeveral times, I perceived glittering on the ſides of the pots expoſed to the heat of the ſun, cryſtalized particles of nitre.

By this it is evident, that nitre is ſometimes an enemy to vegetation, and we muſt not be ſurpriſed at it.

All manures, even thoſe that are beſt adapted to promote fertility, as dung, parts of animals, &c. which aſſiſt vegetation in ſo remarkable a degree, when they are uſed in proper quantities, are nevertheleſs very prejudicial when uſed in exceſs.

I have ſomewhere read, that a certain Gardener had in his ground a monſtrous cabbage, which raiſed admiration in every one who ſaw it. They could not conceive by what means it attained ſo extraordinary a ſize, till in digging the ground, they found that the root had fixed itſelf in an old ſhoe.

I am alſo acquainted with ſome meadows, which are frequently by art flooded by the waters of a brook which waſhes the town ſlaughter-houſe. Theſe meadows yield ſo large a quantity of hay, that the like was never before ſeen in any other part of the country.

Every fourth year the hay grows coarſe, having hard ſtalks, which greatly leſſen the value of the fodder, inſomuch that the owners are obliged to plow up theſe meadows, and ſow them for three ſucceſſive years, in order to abate their rankneſs. After this the hay is again fine, of a good quality, and amazingly plentiful.

As to Nitre in particular, I have frequently uſed it with ſucceſs, and it greatly promotes the vegetation of plants, if it is applied with caution.

From theſe collected facts I conclude, that Nitre is uſeful or prejudicial according to the application that is made of it.

But we muſt guard againſt miſtakes, for common ſalt has not the ſame qualities as nitre, and does not in ſo great a degree aſſiſt vegetation. Common ſalt, as well as all other ſalts, if they are properly applied, looſen and ſeparate the particles of the earth, ſo as to adapt it to the reception of vegetables. But nitre, ſea ſalt, and all ſalts in proportion as they participate the qualities of nitre, have a neutral ſalt in their ſubſtance which contains not only an acid but an alkali, together with a phlogiſtick, or inflammable oil, and a fine inviſible and impalpable earth, which ſerves as food for plants, and to which water ſerves as a vehicle to convey it into the pores of plants.

It is this matter which renders manures from the animal kingdom ſuperior to all others.

Some may imagine no earth can be inviſible; what can be clearer than the chryſtaline water of a fine ſpring? It has however been demonſtrated, by numberleſs experiments, that it contains this earth, which is the principle of all vegetation; it was therefore inviſible in this water which was ſo clear and limpid.

FIFTH PRINCIPLE. The chemiſts extract from all material beings, ſalts, oil, and a ſpirit, which are the active principles of corporeal ſubſtances; but we may obſerve at the ſame time, an aſtoniſhing difference in the taſte, the nature, the properties and the effects, of theſe principles; yet how few are they, in compariſon to what we are ignorant of?

I have not the leaſt doubt, but that there is among theſe ſalts, oils and ſpirits, as great a variety as there is amongſt the different kinds of animals, and even of plants; theſe are however unfathomable depths, which as frequently occur in agriculture, as any other ſcience.

We will now come more immediately to the matter in debate.

Hitherto it may eaſily be perceived, that I incline more to the opinion of thoſe who imagine that every plant requires a different nouriſhment, than to that of thoſe who conceive that they are all nouriſhed by the ſame food.

No theſis on this, or indeed any ſubject, ſhould be poſitively and excluſively ſupported againſt all other reaſoning. I admit of exceptions, reſtrictions and diſtinctions. The opinion I am moſt inclined to favour, is that advanced by Mr. Home, in his Principles of Vegetation, and that which I controvert, is the ſame which Mr. Du Hamel ſeems moſt to approve of.

The third and fifth Principles appear to me to demonſtrate, that there ſhould be a real difference betwixt the food of different plants which vary much in their real and accidental parts, in their ſalts, their oils, and their ſpirits, and in a word, in their very eſſence.

By the ſecond Principle it is inconteſtable, that as there is a viſible analogy betwixt animals and vegetables, the nouriſhment of vegetables muſt of courſe be more different than is that of animals. Some animals are carnivorous, others eat ſeeds, fruits and roots; many feed on graſs, and what a difference is there even amongſt theſe laſt.

Horſes, oxen, ſheep, aſſes, and goats, in general live on the ſame food; but it has been remarked, that ſome eat with eagerneſs thoſe plants which others refuſe, and that certain plants which are poiſonous and injurious to ſome animals, are wholeſome and palatable to others.

Some will feed on any thing. Hogs eat fleſh, blood, fruits, corn, and graſs, they refuſe nothing.

I imagine it is the ſame with plants. Some not being very delicate indiſcriminately receive all kinds of juices; others are fed by only ſome particular kinds, and ſo far reject others, that they pine and die, if the earth in which they are planted happens to be exhauſted of the juices they require.

I have made ſeveral experiments in this matter. Some plants have not ſucceeded in a ſoil where others have throve amazingly. It is not that theſe plants required a great quantity of nouriſhment; for the land was very good, but it had not the quality the plants required.

Some plants are ſo voracious that they naturally imbibe all kinds of juices and ſalts: if their proper food is not at hand, they will take ſome of a nature inferior, nay ſometimes hurtful.

Oxen, horſes, ſheep, &c. are fond of graſs either green or dried; for want of this fodder they feed them with ſtraw, and ſheep with leaves of trees.

In time of war or ſcarcity we have been frequently obliged to feed our cattle with half rotted ſtraw or ſtubble that had been uſed for thatching. No one can ſay this is their natural food, neither can it be at all times recommended. Dogs are not fond of fiſh, and much leſs dry than freſh: yet we learn from the relation of travellers, that the inhabitants of Siberia, who uſe great dogs in their ſledges, lay up no other proviſions, either for themſelves or their dogs, but dried fiſh.

The diverſity in the food occaſions alſo a diverſity in the effects. Different ſalts and dungs occaſion great differences in the taſte and colour of plants, of their fruits, of their flowers, and of their properties. This is a well known truth.

Skilful Gardeners well know what manures they ſhould uſe to give a good taſte to their pulſe, and what on the contrary they ſhould avoid, for fear of giving the plants a bad taſte.

It may not be amiſs to give a few inſtances of this, they will ſerve at the ſame time to prove that the quantity and quality of a food, to which the plants are not accuſtomed, produce aſtoniſhing effects, and haſten their deſtruction.

A friend of mine, who is yet living, aſſured me, that having an inclination to plant ſome maize or Turky corn, he collected ſeveral ſorts of dung, ſuch as that of cows, horſes, ſheep, goats, hogs, pigeons, poultry, &c. of which he made a ſteep. In this he ſteeped his ſeed till it ſwelled. The maize was all of the whitiſh yellow ſort. At harveſt there was a perfect variety in the corn, a light and dark blue, a red, with a whitiſh and full yellow, being viſible on the ſeeds; and the ſheaths of the ſtalks were of all theſe colours.

The ſame thing happened to me a ſhort time ſince. I cauſed ſome of this ſeed to be planted, all of the yellow kind, in a piece of land where formerly all kinds of dung and filth had been thrown; and I had the ſame variety in the ſeeds at harveſt.

Floriſts obſerve, that the variegated tulips are never ſo fine, nor ſo much varied, as when the bulbs of the roots are ready to periſh; whence they conclude, that this great variety in the colours is a diſeaſe. They ſeem to me to be in the right. Bulbous rooted plants require more nouriſhment than thoſe which are fibrous rooted; they imbibe and receive every kind of moiſture and liquid, together with all the juices and all the ſalts which theſe liquids contain.

It happens to them, as it too often happens to men, that intemperance, exceſs, and a variety of food, bring on diſeaſes and death. Every year the moſt valuable bulbs are taken up and replanted: the earth can never be ſo equally prepared as to contain the ſame juices, the bulbs of the flowers feed on them all; in the end however they languiſh, and periſh prematurely.

Another fact ſerves to confirm this argument. If the bulbs of tulips are left many years in the ſame ſoil without being taken up, the flowers become either wholly red, yellow, or ſometimes white, according to their original colour; at laſt they grow ſmall, their petals pointed, with green edges. The reaſon for this may be diſcovered in the preceding obſervation. As ſoon as the variety of juices is exhauſted, and that only the groſſer and more ordinary kinds are left, the variety of colours is of courſe at an end: finally, theſe laſt are ſo far exhauſted, that they cannot produce perfect flowers, either in point of ſize, ſhape, or colour; the colour of the leaves, which are ſatisfied with ordinary food, mixing itſelf in the flowers.

The violet and the gilly-flower may be variegated by nitre, or by any nitrous ſubſtance: by lime rubbiſh, marl, aſhes, &c. It may perhaps be alledged that this is a proof that plants are indiſcriminately nouriſhed by the ſame juices: but I ſay, that this is a diſeaſe occaſioned by a ſuper-abundance of nutritive juices, or by their being of an oppoſite nature.

A curious fact related by M. J. Aug. Grotian, Avocat of the Imperial town of Nordhauſen, in his treatiſe on the culture of violets, pinks, and auriculas, will ſerve as a proof of this aſſertion. "With a lye made of ſheep's dung, I have, ſays he, changed a red violet into a mottled colour: it was a plant with ſingle flowers, and full blown. It grew in a middling ſized pot, ſuch as is generally uſed for pinks. I made the experiment after ſun-ſet, and finding the earth required a good watering, I put the pot into a tub full of lye made of ſheep's dung, in ſuch a manner, that the liquor was a little above the edge of the pot. I left it there for twenty-four hours, after which I ſet it in a place where the ſuperfluous liquor might drain away. In about an hour I found that all the flowers were very elegantly mottled, but in a few days afterwards the plant languiſhed and died." This inſtance ſhews the effects of too great an abundance of ſuch nouriſhment as the plant had not been accuſtomed to.

If this water, impregnated with ſheep's dung, had not been too plentifully applied, or if it had been lowered by other mixtures, or by plain water, the plant might poſſibly have ſupported it. But its conſtitution could not reſiſt this plethora, occaſioned by ſo ſucculent a food ſo plentifully applied, and which it was forced to imbibe on account of its dry ſtate. This is like what is ſaid of a Lady of quality, who hearing of ſome people being ſtarved to death, ſeemed much ſurpriſed at it, aſking why theſe people did not eat bread and cheeſe rather than be ſtarved; which food ſhe herſelf would be content with if ſhe could get no other.

It is alſo remarked, that the ſame plants do not thrive equally well in all places. Some thrive beſt in vallies, others on riſing grounds, and not a few on mountains. Some again prefer dry ſituations, whilſt others grow beſt in moiſt grounds. Some grow in ſprings of clear water, but others thrive beſt in putrid water, growing moſt luxuriant in muddy marſh ditches. Does not this difference manifeſtly proceed from the different juices contained in theſe different ſoils?

Some may attribute it to heat or the air; but the degree of heat has very little or no influence in this matter, for it would be very eaſy to find places equally hot or cold. The air might indeed have ſome little influence, but it appears to me, that the whole may be attributed to the quality of the ſoil.

I muſt here refer to an excellent Eſſay, written by M. de Graffenreid Lord of Worb, on the culture of exotic trees.

The Chamœrhododendron, and ſeveral other Alpine plants, were ſo difficult to be cultivated in gardens, that ſome have aſſerted it was impoſſible to make them ſucceed. He has, however, found the ſecret of doing it, without borrowing either the ſun or air of the Alps, only by endeavouring to prepare the earth for them, in ſuch a manner, that it may as much as poſſible reſemble their native ſoil. Who then can aſſert, that all plants extract the ſame nouriſhment from the earth?

An experiment I have made, though leſs fortunate, evidently confirms what is above related.

I had a mind to remove ſome very fine plants from the Alps into my garden. None of them ſucceeded. I found that the difference of the ſoil was the occaſion of it.

I then procured and planted ſome *Silene à caulis*, preſerving a globe of earth about the root of the plant. This fine plant throve very well whilſt it was nouriſhed by its native earth; but ſoon after it was tranſplanted, notwithſtanding all the care I took, it died.

The improvement of land by marl, in like manner, ſupports my ſyſtem. It is well known, that this manure, in a greater or leſs degree, abounds with alcaline and nitrous particles.

It is of infinite uſe in arable land, for being mixed with the ſoil by the plough ſhare, it pulverizes the earth by its ſalts, deſtroys the weeds on the land, at the ſame time yielding corn with ſtrong ſtalks, large ears, and ſizable, heavy, well-fed, and perfect grains.

Since therefore marl deſtroys certain plants, and gives an extraordinary vigour to others, how can it be ſaid, that all plants require the ſame nouriſhment? But to go ſtill farther, it is well known, that if pure marl is applied for any length of years, the ſoil will be impoveriſhed ſo as to bear nothing. What reaſon can be aſſigned for this ſterility? I can readily diſcover it in my hypotheſis.

Marl contains, in any plentiful degree, only one kind of ſalt; inſomuch that the others can ſcarcely be brought in compariſon. Now plants, having occaſion for different ſalts in a greater or leſs degree, exhauſt the ſoil of theſe other ſalts. After this, only that kind of ſalt remains with which marl abounds, and this is not alone ſufficient to afford nouriſhment to plants, which require a mixture of ſalts.

It is on this principle that, to remedy this inconvenience, they do one of theſe two things, either mixing the marl with dung, or elſe, after having uſed, for three or four years, marl alone, they dreſs the land with dung alone. In this method they get amazing crops. And what is the reaſon of it? It is on account of the plenty and variety of ſalts contained in the marl and dung, by which the plants are ſupplied with all the nouriſhment they require. Amidſt this plentiful variety of food, they may prefer that which is beſt adapted to their nature, and in ſuch a proportion as will ſatisfy their wants.

I ſhall now explain my idea by an imaginary calculation.

Let us ſuppoſe ten ſorts of plants, and that theſe ten ſorts ſhould require twenty kinds of ſalts or juices.

One will want ten-twentieths, another five, another four, another three, another two, and another one-twentieth of one of theſe kinds. Here then are twenty-five-twentieths. Thus we find a deficiency of five-twentieths of this kind of ſalt, to afford the plants food in proportion to their nature and their wants. What muſt then be the conſequence? Doubtleſs the plants which require the largeſt quantity of one particular kind of juice, having their organs better adapted to attract and imbibe that juice than the other plants which require leſs of it, will engroſs the whole quantity, to the loſs of their neighbours, which will die if this food is any ways eſſential to them, or at leaſt languiſh.

But what will be the conſequence if of ten plants growing in this ſoil, four ſhould require ten, twelve, or fifteen-twentieths, and that of courſe there would be a dificiency of two-thirds of the neceſſary nouriſhment? Muſt not two or three be overpowered by the reſt, and abſolutely periſh?

By adopting theſe principles, we may give a very ſimple ſolution to a phenomenon, which the ancients could no otherwiſe explain than by the terms ſympathy and antipathy of plants.

One plant requires eight-twentieths, another five, a third four, and another three-twentieths of one ſame kind of nutritive juice; the other part of their food being extracted from various ſubſtances which three of them have no ſhare in. All thrive and proſper; this is a ſympathy. But when, according to the above-mentioned ſuppoſition, the contrary happens, and that one plant robs another of its food, it is called antipathy.

How comes it to paſs ſometimes that a poiſonous plant and it's antidote will grow in the ſame place, and often very near each other? Can we perſuade ourſelves, that plants of ſo very contrary natures imbibe the ſame juices?

We ſhall give a few more inſtances; experience ſhould be our only director.

All floriſts know that no mould is more proper for the bulbs of hyacinths, tulips, &c. than ſome wherein cabbages, and other pulſe grew the preceding year. Whatever quantity of food theſe ſo ſucculent plants may have required, there will ſtill remain ſufficient for the bulbs of flowers which require but little leſs; it muſt then neceſſarily be a juice of a different nature from that required by the pulſe.

But farther, floriſts recommend to us never to plant the ſame kinds of bulbs for ſeveral ſucceſſive years in the ſame place, but to change them for other ſorts. Does not this practice ſhew, that they do not ſuppoſe the earth impoveriſhed, but only exhauſted of that kind of juice which was required by one ſort of bulb.

If this is the caſe with bulbous plants, which have a greater analogy one with the other than the numberleſs perennial and annual plants, we may eaſily judge, that there muſt be ſtill a greater difference in theſe laſt.

Let it not be ſaid that I contradict myſelf, becauſe I have obſerved above, that bulbs, and amongſt others, tulips, imbibe all juices. I admit that there are plants which take in all kinds of food, but it is for want of better. If they meet with ſuch as is beſt adapted to their nature, they quit that which is leſs ſo, and take the beſt.

I ſhall now mention another experiment. I have obſerved in an arable field, which had been ſown two years with bere or ſquare barley, that at the third ſowing with rye, the *Hypericum perforatum*, St. John's wort, would make its appearance, and encreaſed ſo much in the year of fallow, as to cover the land. Can it be ſaid, that as faſt as it grew the ſeeds dropped and multiplied the plants? This explanation cannot have place, becauſe the ſecond year after the land was laid down to graſs, a very ſmall quantity of this plant remained, and ſtill leſs and leſs every year.

This fact can no ways be explained by any other ſyſtem, except that which I adopt. The St. John's wort found very little nouriſhment whilſt the bere was on the land; more when the field was ſown with rye; but when there was only a little graſs on the land, this plant took poſſeſſion of the whole. In the end, however, notwithſtanding the prodigious encreaſe of its ſeeds, the graſs encreaſed and killed it.

The ſame thing is obſerved in the different kinds of grain and land. Sometimes wild muſtard appears, at others cockle and blue bottle. Theſe plants unfold their parts, germinate, ſhoot, and grow when they meet with juices adapted to their nature; but they remain in a ſtate of inaction when they are deprived of theſe juices.

I ſhall give another inſtance, which, in my opinion, ſhould decide the queſtion.

M. Reichard, one of the principal magiſtrates of Erford, has diligently applied himſelf to the ſtudy and practice of agriculture. He had the advantage of his father's example. He ſays that for eighty years paſt (in 1754) both one and the other of them have endeavoured to lay aſide fallows, and to plant or ſow the ſame land for ſeveral ſucceſſive years. His father accompliſhed it for twelve years, and himſelf for eighteen. How came they to think of doing this? In a work publiſhed in German by the ſon in five volumes, called, *The Treaſure of Agriculture and Gardening*, the following is laid down as an incontrovertable principle.

"It is certain, ſays our Author, that every fruit and plant only extracts from the earth the ſalts and the ſubſtances which are required by its nature and eſſence, and on the contrary rejects and leaves thoſe which are required for the vegetation of other plants. This requires no very extenſive proof, becauſe the truth of this principle is within the reach of our ſenſes; being evident to our ſight, our taſte, and our ſmell. It is manifeſt that an onion has extracted from the earth juices very different from thoſe extracted by a carrot. It is in the ſame manner apparent, that thoſe kinds of pulſe which form themſelves in the earth, have not extracted from the field the ſame particles as the poppy, aniſe, baſtard ſaffron, and other plants of the ſame nature require, becauſe they chiefly conſiſt of oily particles."

From this our Author draws a concluſion which becomes a ſecond principle. "We may, ſays he, hence conclude, that when a ſoil is exhauſted ot all the juices proper for the ſupport of a certain crop, ſo as not to be able to ſupport the ſame crop another year, it may ſtill have ſtrength enough left to ſupport other plants or fruits.

For this reaſon crops ſhould be varied as much as poſſible, not only in gardens but in fields, and by cultivating them in ſucceſſive order, they ſhould be in ſuch a manner interchanged, that the ſame crop ſhould not be repeated till the earth has had time to recruit its ſtrength, and collect a freſh quantity of thoſe ſalts which are beſt adapted to the vegetation of the particular plants in queſtion.

If it ſhould be aſked, how a ſoil which is exhauſted of certain ſalts, can, after reſting as far as relates to one crop, collect a freſh quantity of the ſame ſalts which this particular plant requires, without any new manure being applied, I make anſwer, that in my opinion theſe ſalts are a new collected in the earth from the rain, ſnow, and dew, principally from the dung which remains, and is diſſolved by ſlow degrees, being prepared for the vegetation of theſe particular plants."

On theſe principles have Mr. Reichard and his father acted for eighty years. They made it their ſtudy to find out what plants were beſt adapted to ſucceed one another. This ſtudy is of ſuch real importance, that others being willing to imitate them without having any knowledge of this ſucceſſion of crops, have never been able to ſucceed, yet knew not to what cauſe they ſhould attribute their bad ſucceſs.

If we reflect ever ſo little, we ſhall conceive that theſe thoughtleſs imitators inconſiderately ſowed or planted ſeeds which required, in a greater or leſs degree, the ſame kind of juices and ſalts.

Mr. Reichard, who, as well as his father, had for many years ſtudied the nature of plants and their nouriſhment, ſowed with diſcretion ſucceſſively the ſeveral ſorts of ſeeds. In this manner the earth might, in one ſenſe of the word, be ſaid to be in repoſe, collecting freſh juices for plants which could not do without them, whilſt it ſupported other plants with the juices the firſt had no occaſion for.

I am apt to think no other poſſible reaſon can be aſſigned for this.

Perhaps in relating the method purſued by Mr. Reichard we ſhall find an oportunity of making ſome uſeful remarks.

1. He lays the firſt year thirty loads of dung on every acre, which is turned in by the plough before winter, or what he greatly prefers, the ſpade.

Remark. We muſt in this place obſerve, that thirty loads being three times as much as is generally laid on an acre, it is not at all ſurpriſing, that the ſoil ſhould long continue in heart: but beſides, that this cauſe cannot ſubſiſt above three or four years, we muſt pay ſome attention to the plant it is to ſupport the firſt year.

2. The firſt year he plants all ſorts of cabbages and lettices.

Remark. Every body knows that theſe plants when cultivated in gardens require a great quantity of manure, and ſhould we calculate how much was laid on the beds where they grow, we ſhould find it greatly to exceed the proportion of thirty loads per acre.

3. The ſecond year he ſows onion ſeed; or, if the quantity would be ſo large that vent cannot eaſily be found for it, he recommends the planting of cabbages once more, or of radiſhes and cucumbers. He ſays that the ſoil not being yet exhauſted of the ſalts adapted to the vegetation of the cabbage, that plant may be hazarded a ſecond year.

Remark. Cabbages are frequently planted ſeveral ſucceſſive years on the ſame ſpot, but then the land is freſh dunged every year. Here no freſh dung is laid on, yet the onions, and the other plants recommended by the author, are not leſs exhauſting to the land.

4. The third year he ſows carrots, parſneps, radiſhes, and gourds.

Remark. All theſe plants require a great deal of nouriſhment, and extract it from ſome depth, like cabbages, ſo that the arguments uſed by the Engliſh writers fall to the ground.

5. The fourth year, baſtard ſaffron, poppies, and kidney beans.

Remark. Theſe plants, at leaſt the two laſt, require a good ſoil.

6. The fifth year, turneps, rape, carrots, and beets.

Remark. What! after the land has borne plants, which require ſo much nouriſhment, does he plant them again? We muſt then conclude, that during the courſe of the fourth year, the ſalts adapted to their growth were collected anew.

7. The ſixth year baſtard ſaffron, poppies, and millet.

Remark. Millet is ſaid to impoveriſh land more than any other kind of grain.

8. The ſeventh year winter rye, which if it does not require the beſt of ſoils, at leaſt is not contented with one ſo indifferent as ſome other ſorts of grain.

9. The eighth year winter rye again.

Remark. In this part of the world it is generally thought that the ſame grain ſhould never be ſown two ſucceſſive years. It muſt be admitted, that our author requires that the land ſhould be plowed immediately after harveſt; that it remain in this ſtate till the end of October, or longer, if the ſeaſon permits; that it ſhould then be plowed again and ſown.

10. The ninth year barley, wheat, and ſummer or ſpring rye.

Remark, All theſe grains, particularly barley, require a good ſoil.

11. The tenth year the field muſt be plowed very deep, and may then be ſown with carrots and parſneps.

Remark. Could we have the leaſt hope that ſuch roots would thrive in this land, which ſhould ſeem to be entirely impoveriſhed in the preceding nine years, if by a deep plowing it was not ſupplied with the ſalts adapted to the growth of theſe plants, not with any manure?

12. In the eleventh year poppies, baſtard ſaffron, fenugreek, cumin, coriander, aniſe, &c.

13. The twelfth year winter rye.

14. The thirteenth, barley, ſpring rye, and ſummer wheat.

15 The fourteenth year millet, fenugreek, cumin, peas, kidney beans, broad beans, french beans, lentils, &c.

16. The fifteenth year barley.

17. The ſixteenth aniſe, carrots, vetches, and coriander.

18. The ſeventeenth year oats, or if you will poppies, and then

19. In the eighteenth year oats.

Remark. Many of the crops we have above particularized occur in the account of the ſucceeding years.

This author gives alſo ſome other courſes of crops. The ſample I have already given will anſwer my preſent purpoſe, I muſt refer thoſe who are willing to know more of the matter to the work itſelf.

He carries his ſyſtem four years farther; he would have us reap the fruits of our land twenty-two years, without any freſh manure being applied, and without interruption.

Let us add one more remark on this ſubject. Arguments however good, and founded on ſound reaſon, they may be, are liable to be contradicted by other arguments, which often bear the appearance of truth. This is not the caſe with facts and experiments, if we would not appear abſolutely incredulous, we muſt ſubmit to their force.

Mr. Reichard cauſed his work to be printed at Erford, immediately under the eyes of his countrymen. He refers to their teſtimony, and nobody has as yet contradicted him. It is therefore proved, that all theſe facts are inconteſtably true. The conſequences therefore to be deduced from them in favour of this ſyſtem cannot be leſs ſo.

I ſhould, however, imagine I had treated this important ſubject much too ſlightly, if I paſſed over the arguments advanced by the the Engliſh authors, and defended by the celebrated du Hamel, in favour of the contrary ſyſtem.

Nothing can be more extraordinary then the anſwer which the Engliſh make to the obſervation, that the fleſh, the ſhell, and the kernel of the peach muſt neceſſarily be compoſed of different juices.

They ſay that the earth which furniſhes theſe juices, has no reſemblance to the parts of this fruit. Was there ever ſuch a ſolution before made? Can a coarſe earth mixed with a thouſand heterogeneous parts, have the ſame taſte, or the ſame properties, as the infinitely dilated particles which have been extracted from it? It would be very eaſy to retort the argument, by ſaying, that the earth has not the taſte of the fruits; that it is neither ſweet, bitter, acid, oily, or ſalt, therefore the fruits extract no nouriſhment from it.

The fleſh of the peach is ſweet, the kernel is bitter and oily, the ſhell is a woody ſubſtance. If all theſe proceed from the ſame juices, we may as well ſay that a houſe of clay, ſtubble, brickwork, timber, freeſtone, ſandſtone, or marble, in a word, that the windows and ſpring water are all of the ſame ſubſtance, becauſe they are all parts of the ſame houſe, and are all extracted from the earth. Why may not we alſo ſay, that painters colours are all the ſame, and made from the ſame drug. Hitherto I have imagined that the parts required to form a woody ſubſtance, a ſolid or oily ſubſtance, and a watery or liquid ſubſtance, were different; but in the opinion of theſe writers, I have been in an error.

They alſo ſay, that corn does not put forth deep roots, and that for this reaſon it thrives very well after clover and lucerne, but that theſe laſt do not ſucceed after Saintfoin, which ſends its roots deep into the land.

In this there are ſeveral errors. 1. It is true, that we do not diſtinguiſh any tap root, or other deep roots in corn; but are we certain, that the ſeveral ſorts of grain do not ſend their roots deep into the land when the ſoil is well prepared and adapted to their nature; many proofs of the contrary might be brought. Beſides, why do farmers in ſome places plow ſo deep a furrow, even frequently to the depth of a foot or more? Does not the farmer imagine when he takes this trouble, that the roots can draw nouriſhment from that depth; and does not experience convince us, that in ſtrong lands deeply plowed, the corn is leſs ſubject to lodge, and is more vigorous?

Fortunately they do not aſſert, that corn will thrive well after ſaintfoin. This would be in contradiction to all experience, though that plant ſends forth very deep roots. But they do not aſſign any reaſon for this, which is, however, very ſimple, being the ſame why lucerne and clover do not ſucceed after ſaintfoin. Saintfoin thrives in the moſt barren, ſandy, gravelly, and dry lands; but the two firſt, like all ſorts of wheat, require on the contrary a good ſoil.

The author of this eſſay addreſſes his objections to Mr. Du Hamel, as being the great partizan of the Engliſh ſyſtem, on the effects of the form or organization of plants. If there is any doubt of Mr. Du Hamel's meaning to attribute the various effects of vegetation to this organizition alone, without the the concurrence of any difference in the juices; it is at leaſt the ſenſe which his words ſeem to import. It is therefore only on this firſt ſuppoſition, that we addreſs to him theſe objections, which are meant to prove how little ſatisfactory ſuch a ſyſtem is.

Let us now ſee what objections M. Du Hamel propoſes. "It cannot be doubted, ſays he, but that the earthy particles which plants imbibe, aſſume different forms in every plant, but it does not thence follow that the nutritive juices are not the ſame whilſt in the earth."

It ſhould ſeem then that Mr. Du Hamel looks upon the form and organization of the parts alone, and not the matter, the nature of the food, the juices, as the cauſe, which makes a peach have a downy ſkin, a delicious watery melting and ſweet fleſh, a ſhell harder than wood, a kernel ſofter, yet firm, ſweet or bitter and oily, and this wonderful organization muſt be contained in the ſpace betwixt the end of the branch and the fruit, becauſe in the end of the branch and fruit, becauſe in the end of the branch nothing of this kind appears; whereas I always apprehended, that the ſeveral juices being got thus far, were diſtributed according to the rules eſtabliſhed in nature, by the ſovereign Creator, to form the various parts entirely and abſolutely diſſimular.

Firs for inſtance may have the ſame organization throughout; their wood is porous and ſpongy; if they only required a great deal of nouriſhment without any regard to is nature, what tree ought better to ſucceed in wet or even marſhy ſoils than this, yet in ſuch ſoils the wood is abſolutely unfit for uſe? It is well known that if the roots penetrate to any water or even to a ſoil too moiſt, the trees begin to rot at bottom, before they have attained a third of their natural growth. Such as grow in ſoils that are rather dry than moiſt thrive very well, but it is certain that their wood is more ſpongy, and does not laſt ſo long as that which grew in a dry ſtony or gravelly ſoil. The reaſon is ſelf evident. The juices and ſalts to which water ſerves as a vehicle do not agree with the nature of the juice. It requires others which can form a reſin.

This fact alſo proves that plants which require a great deal of nouriſhment, imbibe all they meet with, for want of that which is better adapted to their nature; but as every kind of food is not equally adapted to their nature, it is evident that if they find what is proper for them, they will, after the manner of animals, reject the others.

This author relates an experiment extracted from the memoires of the Acadamy of Sciences. That a young lemon of the ſize of a pea being grafted by the ſtalk on the branch of an orange tree, encreaſed in ſize ripened and preſerved its quality of a lemon without participating in any thing of the orange-tree. "It is therefore neceſſary, ſays he, in this experiment that the juices of the orange-tree ſhould ſuddenly change their nature in paſſing into the lemon."

It is evident I relate this paſſage impartially; but I will do ſtill more, namely, add ſome other inſtances to ſtrengthen this argument.

A ſhort time ſince, a friend of mine, a man of note, ſhewed me at his large and elegant villa, a wilding apple-tree, on which were grafted ſeveral ſcions of a ſuperior kind, amongſt the reſt there happened to be one of a pear-tree, which ſucceeded as well as any of them.

I will next mention ſomething ſtill more ſtriking.

M. Tſchiffeli, (that worthy patriot, inſtitutor of our œconomical ſociety) has attempted to graft ſeveral ſorts of ſcions without choice, on the roots of various trees without diſtinction. Almoſt all theſe ſcions ſucceeded; whence ſome conclude that my ſyſtem is entirely overſet.

Let us now examine whether it is even at all affected.

The two firſt experiments of the lemon on the orange-tree, and the pear on the apple-tree, are too much alike to be ſeperated. Let us conſult Linnæus and his ſyſtem with regard to plants. In the Edition 1752, he has 1090 genuſes, and in every genus from 1 to 30 or 40 ſpecies. Without attending to ſubdiviſions, all the pears are of one ſpecies, as well as all the apples, plumbs, peaches, cherries, lemons, citrons, oranges. Farther, apples, pears, and quinces, are three ſeveral ſpecies of fruit of the ſame genus; lemons, citrons, and oranges the ſame, as alſo plumbs, apricots, and cherries, peaches, and almonds.

According to our ſyſtem the greateſt difference of juices ſhould be amongſt the 1090 genuſes; they will be much leſs amongſt the ſpecies, and there will be but very little amongſt the varieties of the ſame ſpecies; I mean that there would be a great deal of difference betwixt thoſe of a walnut-tree and a peach-tree, much leſs betwixt thoſe of an orange-tree, and a lemon-tree, and a very little betwixt the ſeveral kinds of theſe fruits. Conſequently why ſhould we be aſtoniſhed that a lemon ſucceeded on an orange-tree, a tree of the ſame genus, or the ſcion of a pear-tree, on an apple-tree?

Gardiners and Huſbandmen, nay all who are not groſly ignorant in this matter, well know, that ſcions of kernel fruit-trees, are grafted on kernel fruit-trees; pears and apples on quinces, and thoſe of ſtone fruit-trees, as peaches, on plumbs and almond-trees; with this management they will take; but I never ſaw a ſcion of an apple-tree ſucceed on a cherry-tree, nor that of a peach-tree on a quince. By drawing the concluſion in the manner of M. Du Hamel, we may ſay that he who proves too much proves nothing at all. All ſorts of ſcions grafted on any tree ſhould ſucceed, but this is contrary to experience.

It may perhaps be ſaid, that I attend not to my ſubject, that the experiment of M. Tſchiffeli, proves it to be a truth that all ſorts of ſcions equally well ſucceed on all ſorts of trees. But this is a miſtake, it is only on the roots which is totally different.

It ſhould ſeem that the roots of trees greedily imbibe more or leſs all kinds of juices. From the roots theſe juices paſs into the bark, thence into the wood of the trunk, afterwards into the branches and their bark; laſtly into the buds, leaves, flowers, fruit, &c. Now let any one judge, by the difference of theſe juices and their flavour, in the fruit, and in the roots, how much they have been purified, changed, and as we may ſay, refined in their paſſage, and by the circulation, before they arrive at their deſtination.

Let any one chew ſome wood, ſome bark, ſome of the leaves which grow ſo near the fruit, and laſtly ſome fruit, and then declare whether there is not an infinite difference. The order of nature conveys to every part the juices beſt adapted to the end for which God created them.

Let any one reflect on the ſweetneſs of the kernel of a wallnut, and on the inſupportable bitterneſs of the rind or bark of the ſhell, which all animals and even inſects nauſeate. It ſurrounds the nut, of courſe it is very near it, and the whole nut, as well the kernel as the rind, is ſuſpended on the ſame ſtalk; thus is the difference much more ſurprizing, than that of a lemon, and an orange, growing on an orange-tree. Did the ſame juices nouriſh both one and the other? Can this great difference be owing to the organization and ſtructure of the nut, or are theſe organs placed at the end of the branch? finally what part could have effected ſuch a difference. Let us reaſon a little on this head.

We have obſerved that matter is real, form accidental; what is accidental, may be, or may not be, but matter will always be ſubſtantial let its form be what it may. Wood is ſtill wood, though it may be ſquare, round, hexegonal, octogonal, or of any other form; and ſhould any ſay that wood is only wood becauſe it is ſquare, without which quality it would be ſtone, he might with great reaſon be laughed at; how then can form which is accidental, have any influence on matter which is ſubſtantial? Let it not be ſaid that the form in ſalts, acids, and oils, occaſions their qualities. I will only partially, not wholly, admit this; if the particles of the various kinds of ſalts are the ſame, and give them the ſame qualities as ſalts, yet are their effects amazingly various.

But let us advance a ſtep farther. It muſt be admitted that matter muſt neceſſarily exiſt before form, ſince matter can ſucceſſively aſſume various forms. I will then ſuppoſe that the form, the organization, may ſomewhat contribute to the difference of juices, and flavours in a fruit. From whence proceeds the origin of this organization, this form, what is the cauſe of it? We muſt have recourſe to the matter; without the matter or ſubſtance no form could ſubſiſt, of courſe it cannot be denied, but that the ſubſtance, the matter, the ſalts, and the divers juices conſtitute the primitive cauſe, and this cauſe ſubſiſts throughout, though the organization may in ſome ſort be aſſiſtant to the effects, becauſe the ſubſtance remains to the end of nature's operation.

But to return more immediately to the ſubject in hand; I have ſuppoſed 1090 genuſes of plants, which for the moſt part require a particular food. In every genus, taking one with another there are twenty ſpecies. The ſpecies, for inſtance, will require fifteen-twentieths of the ſame food, as orange trees and lemon-trees; ſome will require eighteen-twentieths or nineteen-twentieths more or leſs; and theſe fifteen to ten-twentieths ſhall be varied by compoſitions and mixtures more artfully made than thoſe of chemiſts. We muſt not then be ſurprized, if a branch or a fruit requiring only one-twentieth or two-twentieths ſhould find wherewithal to ſupport itſelf, amongſt the quantity and different qualities of the juices, diſperſed in the wood, the branches, and the leaves of a tree, and of a kind which others do not want, thus is there nothing to be wondered at in the ſucceſs of the lemon and the pear-tree ſcion.

The ſame may be ſaid of the grafts on the roots. If I had had any opportunity of obſerving what grafts ſucceeded and on what kinds of roots, I might perhaps have been able to have deduced ſome arguments from the experiment, and made obſervations on the ſubjects more exact than I now can; this not being in my power I will ſuppoſe they ſucceeded on all kinds of roots, and even this will not prove againſt me.

We have already obſerved that the roots imbibe in a manner all the juices they meet with, and that the ſeparation, the coction, the refining, and ſtraining the juices, are only done ſucceſſively and by ſlow degrees. If then a ſcion is grafted in the root, it is near the reſervoir of all the different juices, and may chuſe which ever is beſt adapted to it's nature, rejecting the others. Theſe roots ſerve as organs, mouths, and channels to convey to it the nouriſhment it may require. This is proved by well known experience, for in grafting on the trunk, at a certain height, or on the branches, ſuch an aſſociation never ſucceeds. If we endeavour to graft a peach on a walnut though they are both kernel fruits, or a pear on a cherry-tree they never ſucceed. And what is the reaſon of it? Becauſe at this height the tree by purifying the juices, has left behind the greateſt part of thoſe which are not adapted to it's nature. I therefore conclude that this experiment is rather in favour of my ſyſtem than againſt it.

We form to ourſelves groſs ideas from the evidence of our ſenſes and our falſe conceptions of things. As ſoon as we have adopted an idea, we imagine we have diſcovered the depths of nature, and explain the cauſes of effects by what we ſmell, feel, and ſee. Chemical experiments are the *ne plus ultra.* We imagine that by analyſing ſome ſubſtances by chemiſtry we diſcover the elements and true principles of plants. This ſcience has indeed been the means of making ſurprizing diſcoveries, yet have we by the help of it diſcovered only the groſſeſt of theſe elements, which muſt themſelves be compoſed of an infinity of others, inviſible, impalpable, and which eſcape the notice of our ſenſes.

We muſt not conclude, becauſe we have not been able to diſcover theſe juices by the help of chemiſtry, or by other experiments, that they do not exiſt. How many real and inconteſtable facts are there, of which the true cauſes are not known, but conjectures and gueſſes are ſubſtituted for them.

The anſwer Mr. Du Hamel makes to the ſecond allegation, appears to me to be very weak. "We do not, ſays he, diſcover in the earth any flavour of the fruit, of courſe the juices of the earth are not the cauſe of it." I ſee nothing of thoſe fine brocades in the worm that ſpins the ſilk. I do not perceive this flavour, this taſte in raw meat, therefore the ragout is not made of it. I do not ſee that admirable painting in the colours, either ground or unground, nor in the bruſh, therefore it is not to them that the picture is indebted for its luſtre.

The anſwer to the third allegation is not more coercive. It is only neceſſary to read it, to perceive that I am of his opinion, namely, that plants, when they have no choice, indiſcriminately imbibe all juices, even ſuch as are detrimental to them; but then they ſoon decay.

The anſwer made by Mr. du Hamel to the fourth allegation, has already been diſcuſſed. It will ſuffice to ſay one word with reſpect to the reaſon he alledges, why ruſhes, thiſtles, or blue bottles, ſhould not, according to our ſyſtem, kill wheat, as thoſe plants only imbibe ſuch juices as are not adapted to the wheat.

Who informed this writer that they imbibe none of theſe juices? It is very probable, that according to my imaginary calculation, they have occaſion for fifteen-twentieths of the ſame juices, and the wheat alſo of courſe requires fifteen-twentieths, ſo that there will be a deficiency of ten-twentieths on the whole, ſome of theſe plants therefore muſt languiſh and die. Wheat is cultivated, and weeds growing naturally, and being of a voracious nature, the laſt get the upper hand and deſtroy the firſt.

Some have endeavoured to prove by chemiſtry, that plants only tranſpire a pure phlegm. Beſides what we have already ſaid, relative to the inſufficiency of chemical experiments, this confirms the allegation, "that every plant only appropriates to itſelf the parts neceſſary for its nouriſhment, and that the others paſs off by tranſpiration." This writer, doubtleſs means, that the plant, having by means of its root, imbibed all kinds of ſalts and juices, and only reſerving what is adapted to its uſe, the others muſt of neceſſity be found on diſtillation, and in this he is miſtaken.

To return to the analogy there is between plants and animals, if man made a good uſe of his will, he would not haſten his death, and frequently paſs the better half of his life in acute pain, which he has brought on himſelf by intemperance; he would reject unwholſome food, and content himſelf with that which would contribute to prolong his life, and make him paſs it free from diſeaſe. Beaſts, guided by inſtinct, take only ſuch as is ſuited to their nature, unleſs they are compelled by neceſſity to do otherwiſe; it is the ſame with reſpect to plants, to which the order which God has eſtabliſhed in nature, ſupplies the place of inſtinct. They never imbibe juices which are not adapted to their nature, unleſs they are compelled to do it, ſo that they have no occaſion to diſſipate them. If they are obliged to receive an uncommon food, theſe juices, though hurtful, muſt be converted into nouriſhment, the ſame as in men and beaſts, and being by their concoction become more groſs and ſubſtantial, they cannot be diſſipated in the air.

One thing more is to be remarked. A great part of the food which men receive eſcapes by means of various ſecretions; but that which is converted into blood, is diſſipated by tranſpiration, in order to it's being ſucceeded by the after-taken nouriſhment.

It is the ſame with reſpect to plants. The roots attract and imbibe the groſſer juices of almoſt every kind, and begin to diſcharge themſelves of ſome to form the wood, rejecting that which is abſolutely contrary to their nature; the juice that is ſomewhat purified enters into the bark, whence, one part like the blood, paſſes farther through the bark and the wood, into the branches; being ſtill more and more ſubtilized and purified, the juices paſs, as nature directs, into the leaves, the flowers, and the fruits; which at length contain only that which is moſt ſuitable, ſelect and exquiſite, being the quinteſſence of all thoſe juices which were originally ſo groſs. This may be compared to the chyle, which is converted into blood; this laſt, with regard to the internal preſervation of the parts of the body, ſerves only to produce a liquid ſtill more delicate, ſoft, and balſamic, which enters into the fleſh, the nerves, and in fact, into every part that requires to be ſupported by a kind of nouriſhment conſtantly renewed. It ſhould ſeem to me, that this analogy renders the ſyſtem I defend, more probable than any other.

I ought on this occaſion, to mention a nouriſhment ſtill more ſubtile belonging to plants, but it would perhaps take up too much time.

Mr. du Hamel will have it, that plants tranſpire, and that the particles which exhale by perſpiration, float in the air, and that being borne away by the winds they cannot again fall to the earth, whence they were extracted.

I admit of all this, what concluſion can be formed from it againſt my ſyſtem? This tranſpiration, mingling itſelf with other particles in the air, turns to clouds, dew, rain and ſnow, falling ſometimes on one ſoil, ſometimes on another, giving a general fertility to the earth, as experience may convince us; thus his obſervation falls to the ground.

We may ſtill add, that plants do not ſolely ſubſiſt on the juices extracted from the earth, by the channels and veins of the roots, the wood, and the bark, but alſo by the leaves. Authors have already acknowledged that they were neceſſary for tranſpiration, and to evaporate what was ſuperfluous, in the ſame manner as the pores of the ſkin in men; but in my opinion, they beſides this, ſerve for aſpiration, extracting a very ſubtile nouriſhment from the air. Many obſervations confirm me in this opinion.

One of my particular friends, fond of every branch of huſbandry from his youth, ſeeing in the garden of a relation, an apple-tree loaded with fine fruit, and knowing that the leaves of vines were pulled off, in order to make grapes ripen the better, he thought to bring theſe apples to a perfect maturity, by rendering them the ſame ſervice. The inſtant the leaves were pulled off, the circulation of the ſap entirely ceaſed; and the following ſpring he was ſtill more mortified, to ſee ſo fine a tree irrecoverably dead.

I have indeed, myſelf obſerved in vines, that the more leaves are pulled off, the leſs the grapes ripen; for though they become yellower than the others, they are not ſo juicy, nor of ſo fine a flavour. It cannot be ſaid that the tranſpiration was ſtopped in the apple-tree, as this might have been continued through the bark and the end of the ſtalks whence the leaves were taken; and even if it had been ſtopped, the effect would have been quite contrary to what it was, for the fruit would have been large, but leſs delicate in its flavour, becauſe the ſap would not have been purified by tranſpiration.

What confirms me ſtill more in the opinion of tranſpiration, is the dew, and its wonderful effects. It is well known not to penetrate the earth, at leaſt not ſo far as the roots of plants, to what cauſe then muſt we aſcribe the admirable ſervice it is of to all plants? It attaches itſelf only to the leaves and flowers, or at moſt to the bark: the effects we ſee reſult from dew, can never proceed from its cooling quality only; it is of much greater ſervice than rain, and this laſt, than common water; though if in times of great drought, when even dew does not fall, entire trees, particularly the leaves, are refreſhed in a morning with common water, by means of an engine, the effect will be ſurprizing.

The honey-dew, on the contrary, does infinite damage to trees, becauſe it ſtops the pores of the leaves, and prevents both tranſpiration and aſpiration; the tree then reſembles a man, who is within full of humours, and whoſe perſpiration is ſtopped.

I am therefore of opinion, that all plants receive the moſt ſubtile part of their nouriſhment from this aſpiration; the dew attaches itſelf to plants, by imperceptable and ſlow degrees, and it is neceſſary there ſhould be a matter as ſubtile as dew, to ſerve as a vehicle to particles ſtill more ſubtile. It undergoes a thouſand and a thouſand evaporations amongſt plants, and every one extracts from it, that which is beſt adapted to its nature; but that theſe particles may have their natural effects, the juices extracted from the earth, which make perhaps ninety, or ninety-nine one-hundredths of the whole, muſt have done their part; for if this is not the caſe, theſe imperceptable particles cannot act on the others, which are infinitely groſſer and more material.

We may paſs over the anſwer to the ſixth allegation. Mr. du Hamel, in his anſwer, attributes the cauſe why wheat does not ſucceed two years together on the ſame land, to the number of plowings being leſſened; this is not of conſequence enough to detain us a moment, as the principles we have laid down, explain it in a very ſimple way.

I ſhall now conclude, hoping that though my ſyſtem may not be allowed as abſolutely certain, that yet it will be acknowledged as founded on probability, at leaſt; and if this ſyſtem has any foundation in truth, it merits a ſtrict examination, and that experiments ſhould be made, as the many parts of it are very difficult to be accounted for. With this view only, it is that I have conſented to publiſh my ideas, not being deſirous of excelling, or of teaching others, who may have much more knowledge in theſe matters, than I pretend myſelf to have.

ARTICLE XXXVI.

An Eſſay on the Naturalization of Foreign Trees and Plants in Switzerland; written by Mr. de GRAFFENRIED, *Lord of Worb.*

IT cannot be denied, but that our country would receive conſiderable benefit, from the eſtabliſhment of good kinds of foreign trees and plants. I will then endeavour to demonſtrate the poſſibility, and the manner of executing it with ſucceſs.

The writings of ancient authors who have treated on the ſubject of agriculture, ſufficiently prove the poſſibility of making trees brought from hot countries, thrive in cold climates. Cato, Varro, Columella, Virgil, Palladius, and Pliny, aſſert, that the much greater part of their beſt kinds of fruit, was in their time, brought from the eaſtern countries into Italy, from whence they afterwards ſpread into the coldeſt countries of Europe.

Lucullus, brought cherries to Rome, from Ceraſonta, a town of Pontus, about 78 years before the birth of Chriſt. Above 100 years afterwards, apricots were carried thither from Armenia, and plumbs from Syria.

Peaches were not known in Rome, till about thirty years before the time of Pliny the Naturaliſt, and took their Latin name Perſica, from Perſia, from whence they were firſt brought. The beſt kinds of pears came from Syria and Egypt; quinces from Crete; cheſnuts, wallnuts, and filberts, from Aſia Minor; the ſervice-tree was not known in

Italy, till the time of Cato the Elder; ſnow-balls, Indian cheſnut-trees, and Jeſſmine, all come from hot countries, and yet ſucceed very well in all parts of Europe.

Modern writers, agree in this matter with the ancients.

Witſon, after a thouſand trials had failed, eſtabliſhed in Europe the coffee-tree, and that king of fruits, the ſuperb ananas. Theſe two plants, though brought from the hotteſt climates, have nevertheleſs ſucceeded in our cold climate, by the help of induſtry and artificial heat, ſo as to bear fruit.

Ginſeng, that precious medicinal plant, which came originally from China, is cultivated with ſucceſs in Canada, from whence it is exported even to China itſelf.

Rhubarb, which was at firſt brought from the Eaſt Indies, has been found in conſiderable quantities by profeſſor Gmelin, and the botaniſts of Peterſbourg, in Siberia, and Ruſſian Tartary, and at preſent makes a capital article in the Ruſſian commerce.

In many gardens in Sweden, Ruſſia, Norway, and Denmark, are to be ſeen the fineſt peaches and apricots: I ſaw myſelf in a valley of the canton of Berne, called Grindelwald, enriched with mountains continually covered with ſnow, and within a cannon ſhot of the Gletſcher, a garden in which the peaches and apricots were perfectly ripe, as well as moſt other kinds of garden crops: the Italian honeyſuckle blows there all the ſummer and autumn.

Mr. Tournefort, found on Mount Ararat, in Armenia, plants which grow wild in the northern parts of Europe, as well as in Italy and France. the ſame traveller, in his voyage to the Levant, found the ever-green oak, (which is only commonly met with in Spain, the ſouthern provinces of France;

and in Italy), growing in the iſle of Candia, at the foot of mountains continually covered with ſnow.

Mr. de Haller, that celebrated botaniſt, that ornament to our country, has alſo diſcovered in his numerous and dangerous excurſions, on the higheſt mountains in Switzerland, herbs and plants which botaniſts had till that time, only remarked on the tops of the Italian mountains.

The new diſcoveries of a Kalm in North America, Koempfer in Japan and Aſia, Haſelquiſt in Paleſtine and Egypt, Oſbek in China, Linnæus in his voyage to the iſland of Schonen, and in his Flora Lapponica, ſufficiently demonſtrate the principle I ſet out upon: and the examples of diverſe other countries might be alledged in proof of it.

Let us turn our eyes towards the prodigious changes which have happened in Germany. That beautiful and fertile part of Europe, was in the time of Tacitus filled with horrid deſarts, and the inhabitants were obliged for want of better food, to eat bitter acorns; and in our times, by means of a laborious induſtry, it is the moſt pleaſant, the mildeſt, and the moſt fertile country in Europe. Inſtead of thick foreſts and unwholſome bogs, we now find there, the moſt fruitful corn lands, the richeſt paſtures, with plenty of wine and excellent fruit.

Let us next ſurvey England. What immenſe advantages have the wiſe inhabitants of that fortunate iſland, derived from the improvement of every branch of agriculture? It is well known that they are indebted to this happy change, for their riches and their power. Caſt your eyes on the country houſes and villas of the Engliſh; of a duke of Argyle, a duke of Richmond, of the late lord Peters, a Collinſon, and on the botanical garden of Sir Hans Sloane at Chelſea, are they not palaces of nature, where art, utility, and all the beauties of the creation, preſent themſelves to your view? Has not the great attention beſtowed on agriculture, immortalized their illuſtrious writers? Read the works of Miller, Lawrence, Mortimer, Evelin, Ellis, Bradley, &c. can we beſtow admiration enough on theſe men? they never had their equals in any other country.

Sweden, upon the inſtances of the immortal count de Teſſin, and the celebrated Linnæus, ſends at the public expence, profeſſor Kalm into England, and ſome parts of North America, to ſearch for foreign trees and plants, and collect œconomical obſervations for the benefit of the kingdom.

The wiſe king of Denmark, a monarch ſuperior to all praiſe, ſends for the ſame purpoſe, three learned men into Arabia Fælix, and other eaſtern countries, which will enrich the kingdom with foreign plants, and natural hiſtory with new diſcoveries.

France is not at this time, leſs attentive to the well being and proſperity of agriculture, that inexhauſtible ſource of power and wealth. The royal œconomical ſociety lately eſtabliſhed, the ſociety of Britany, the writings and experiments of the celebrated Buffon, du Hamel, de Mirabeau, and de Turbilli, the gardens and improvements of Trianon, the duke d'Ayen, the Abbé Nollins, Bombarde, and Aubenton, are ſufficient evidences of the high eſteem the French have for agriculture, and that it not only finds employment for ſome of the greateſt men in the nation, but alſo contributes to their pleaſure.

I conceive I have fully demonſtrated by what I have already ſaid, that it is by no means difficult to make thoſe foreign trees thrive in our country, which are brought from hotter climates, but where the cold is nevertheleſs ſometimes ſeverer than it is in Switzerland, as in Virginia, Penſylvania, Canada, Carolina, Chili, the Cordillieros of Peru, &c. As this is the caſe, why ſhould we not, when we ſhall thereby increaſe the products of our country, endeavour to improve, embelliſh, and ſoften by art and care, aſſiſted by nature, the rudeneſs of our ſoils.

It may poſſibly be objected, that the cold which predominates in the greateſt part of Switzerland, will render my ſcheme abortive. But let ſuch reflect on the great and agreeable change that has happened in Switzerland, with regard to all kinds of fruits.

Forty years ago very little fruit was to be ſeen, and that very bad, whereas we have now the ſatiſfaction of ſeeing our tables covered the year round with the moſt delicious kinds. We have cherries from the beginning of May to November, peaches from June to November, and the moſt exquiſite apples and pears the whole year. If I am aſked what ſorts of uſeful trees and plants we ſtill want, when we have already ſo many; inſtead of giving a direct anſwer, I will make out a liſt of ſeveral ſorts of trees, and in my turn, aſk whether they would not be of great utility in our country.

For inſtance, 1. The White Virginian Oak, bearing ſweet fruit, and good to eat. 2. The Red Virginian Oak. 3. The Cedar of Libanus. 4. The Virginian Cedars. 5. The Armenian Pines. 6. The Sweet Maple of Carolina. 7. The Styrax, or Liquidambar of Virginia. 8. The Saſſafras Tree. 9. The Saſſaparilla. 10. The Ceonothus. 11. The Lobelia (or Cardinal Flower) with blue bloſſoms. 12. The true Rhubarb. 13. The Lentil-bearing tree of Siberia, called Aſpalathus. 14. The Evergreen Oak.

Would not our gardens and villas be more embelliſhed, if inſtead of the Indian cheſnut-tree, the fir, the yew-tree, ſavine and juniper, they were adorned with, 15. The fine Indian Lawrel. 16. The Virginian Tulip tree. 17. The American Tulip tree, with Lawrel leaves. 18. Bignonia. 19. Cedars. 20. The Cherry Lawrel of Portugal. 21. The Arbutus, or Strawberry tree. 22. The Judas tree, with red and white flowers. 23. The Azalea. 24. The Benjamin tree. 25. The Piſhamin. 26. The Liane and Clematite. 27. Pavia. 28. The ſpotted leaved Oak. 29. The Cheſnut tree, with leaves ſpotted with gold or ſilver. 30. Piracantha. 31. Baſtard Ebony. 32. Coluthea. 33. The ſeveral kinds of foreign Roſes. 34. Ketmia. 35. Baſtard Senna. 36. Althea. 37. Grewia. 38. Jupiter's Beard, &c.

After having proved in a clear and evident manner, the poſſibility and utility of naturalizing foreign plants, I ſhould, in order to accompliſh the taſk I have impoſed on myſelf, lay down rules which are abſolutely neceſſary to be obſerved in theſe experiments, and at the concluſion of my eſſay, I ſhall give a liſt of the different kinds of foreign trees and plants, which have for a conſiderable ſpace of time reſiſted the greateſt cold of our climate.

Firſt rule. It will be proper to chuſe for theſe experiments the ſtrongeſt and largeſt plants, ſince it is very evident, that well rooted plants will be better able to reſiſt the extremity of the cold, than thoſe which are more tender and delicate.

Second rule. During the firſt and ſecond years, the plants, according to the nature of the ſeed, ſhould grow in cluſters, and care ſhould be taken to put them in a green-houſe in winter, where the degree of heat ſhould be kept up to the laſt degree of a botanical thermometer, that the time of their firſt ſhooting, the duration of their growth, and the qualities of their wood and buds may be well obſerved. To the laſt in particular, great attention ſhould be had, for in the ſtructure of the buds, ſubſiſt the principal reaſons, why trees which have grown under the equinoctial line, ſeldom thrive in cold countries, having naturally but few buds, and a very thin ſheath, or ſpatha.

Third rule. Trees or plants which are brought from a temperate climate, ſhould always be planted in the ſpring, that they may take firm root before the winter comes on, and accuſtom themſelves by degrees to the cold of our climate; and though the ſeverity of the winter may injure the plants, there will ſtill be room for hope that they will make new ſhoots from the roots, in the ſucceeding ſpring or ſummer.

Fourth rule. It will be neceſſary to get information, in what ſoil theſe plants originally grew; whether it was in a moiſt or dry ſoil, a clay or a ſand, and whether the plant originally grew expoſed to the ſun, or in the ſhade.

Such as neglect theſe precautions, will loſe both their time and money, and will, to their great regret, make a thouſand fruitleſs experiments. This is evident from the many experiments that have been made to introduce the *Alpine Roſes*. If they are not planted in a ſoil and ſituation proper and agreeable to them, not one in an hundred will ſucceed.

As moſt of the North American plants grow in a clayey ſoil, mixed with ſand, it will prove very eaſy to imitate ſuch a ſoil in this country; but I have remarked, that none of theſe artificial mixtures of earth are of any real uſe, for on the contrary, they make the plants ſickly and ſuddenly kill them.

For my particular part, I have found that virgin earth, taken from beneath the turf of a good paſture,

ture, is beſt adapted to moſt plants: we find in the Treatiſes on the Art of Gardening, as well in German as in French, a number of mixtures of earth, dung, and ſand, but I think them very hurtful, or at leaſt of little uſe.

Fifth rule. Such trees and plants as ſhoot early, ſhould be planted in places where they may be ſheltered from the heat of the ſun in the ſpring, in order to retard their ſhooting, and preſerve them from the ſpring froſts.

Sixth rule. Such trees and plants as ſhoot late, ſhould be planted in places expoſed to the heat of the ſpring ſun, that their young tender ſhoots may have time to grow ſtrong before the winter, as leſs danger will then be apprehended from the effects of the cold.

It is neceſſary to obſerve in general, that all foreign trees thrive better and live longer in our country, when in an eaſtern and weſtern (provided they are ſheltered from the north eaſterly winds) than in a ſouthern aſpect which expoſes them more to the ſpring froſts, ſo hurtful to plants. The celebrated Miller ſays, that the fig-tree in a northern aſpect, is in leſs danger of being frozen, than when it is planted in a hotter ſituation.

I muſt alſo farther remark, that the roots of almoſt all the plants herein-after-named, were covered the firſt year, to the depth of four inches, with rotten tanner's bark, and the plants with dry leaves, and wrapped in pea or other ſtraw. The ſecond year, the dry leaves were taken away, the third year the ſtraw, and the fourth the tanner's bark. We muſt alſo particularly obſerve, that every day when the weather is mild, the covered plants ſhould have a certain quantity of air given to them. I was obliged in 1759, having omitted this precaution, to cut off cloſe to the root, a Virginian tulip tree fifteen feet high, which was ſtifled for want of air.

Not having any intention of mentioning in this Eſſay any foreign plant, except ſuch as have ſuſtained for four years in the open ground the cold of our country, the liſt I ſhall produce will not be very conſiderable, but I flatter myſelf it will ſpeedily be encreaſed, as I have reaſon to hope my plantation will ſoon be much augmented. Not long ſince Meſſrs. de Ponthieu, two rich Engliſh merchants, who are themſelves great lovers of agriculture, generouſly encreaſed my ſtock with above 200 American trees and plants, amongſt which are many that no botaniſt has yet deſcribed.

A Liſt of ſeveral Foreign Trees and Plants, which have been four Years growing at Worb.

1. *The Cedar of Libanus*, is a fine tree, very lofty, and ever green, the utility and beauty of its wood, may ſufficiently be known from the Holy Scriptures.

2. *The Tree of Life* from China, is alſo a fine ever green tree, but it is as yet too ſcarce for its utility to be known. The French miſſionaries brought it from China to France a few years ago.

3. *The Tulip tree, or flowering Maple* from Virginia, with curled leaves; it grows to a prodigious ſize; the beauty of its flowers and leaves, occaſion it to be ranked amongſt the moſt elegant of known trees; the wood of it is much eſteemed in Virginia, on account of its utility.

4. *The Maple of Canada*, differs ſomewhat from ours, and is as profitable.

5. *The flowering Aſh tree*, is much eſteemed on account of its flowers, and becauſe the flies and other inſects do not deſtroy its leaves, as they do thoſe of the common aſh.

6. *The Virginian Oak*, ſhould in preference be planted on account of its fruit, which has the ſame taſte as nuts; but its wood is much inferior to that of our oaks.

7. *The white Wallnut-tree*, from Virginia: its fruit is exquiſite, and its wood very fine.

8. *The black Wallnut-tree*, its fruit is black and bad, but its wood is very beautiful.

9. *The Eaſtern Plane-tree* grows to a prodigious height and ſize. The Romans and Greeks valued it much, on account of its ſhade, its ſize, and its duration.

10. *The foreign Maple* of Virginia, does not much differ from ours; its wood in Virginia, is uſed for all ſorts of wheelwrights work.

11. *The Service tree* is very beautiful, its fruit as well as the medlar, may be eaten. It is planted in ſeveral parts of Switzerland, but I do not believe it grows in this country without culture.

12. *The wild Olive tree*, has ſilver coloured leaves, and its flowers have a fine ſmell.

13. *The ſmall Cheſnut tree* with red flowers, is very beautiful whilſt it is in bloſſom.

14. *The Cornilberry tree of Virginia*, has branches of the colour of coral; its trunk is alſo red; it bloſſoms from ſpring till winter.

15. *The Saint Lucie Wood* bears pretty flowers. The turners value its wood on account of its beauty.

16. *The Judas tree*, with red flowers.

17. The ſame, with white flowers. They are both very beautiful.

18. *The Tea tree of Peru, or Carolina.* The inhabitants of thoſe countries, make uſe of its leaves for tea. The flower is very elegant.

19. *The Cherry Lawrel of Portugal*, is a fine evergreen.

20. *The Sumach.*

21. *The Jaſminoides, or Baſtard Jaſmine of China,* its utility is not yet known.

22. *Baſtard Indigo,* is a very pretty ſhrub.

23. *The Emerus, or Baſtard Senna,* the ſame may be ſaid of this plant.

24. *Several ſorts of Ketmia,* are very beautiful.

25. *The Althea,* is alſo elegant.

26. *The Virginian Jaſmine,* is very beautiful.

27. *The Piracantha,* a kind of Medlar, is a very fine ſhrub.

28. *The ſmall Medlar tree of Virginia,* and other kinds, are very beautiful, and make fine ſweetmeats.

29. *The Evergreen Oaks* are very beautiful, they bear ſeed in Languedoc.

30. *The Lote tree, or wild Service tree.* The flower is pretty, and the fruit good to eat.

31. *The Myrtle, or Wax tree of Carolina,* its fruit yields a fine green wax.

32. *The Virginian Strawberry, with ſcarlet Bloſſoms,* the fruit has a delicate flavour.

33. *The Armenian ſcarlet Strawbery,* is ſtill more delicious.

34. *Drayton's Ananas, or the green Strawberry,* excels them all.

A Liſt of ſeveral Plants which were killed in 1761, *by the ſeverity of the winter, not having been covered.*

35. The Chili Strawberry.

36. The Blue Paſſion Flower, or Granadilla.

37. A Species of Virginian Cedar.

38. The Melianthus.

39. The Hamamelis.

40. The Hydrangea.

41. A Species of American Moſs.

42. The Caper Tree.

43. The Ciſtus of Montpelier.

ARTICLE XXXVII.

Practical Directions for cultivating Flax, adapted to the Climate of Switzerland. Written by Mr. TSCHIFFELI.

Of the SEED.

IF good, well cleaned ſeed is not ſown, we muſt not expect to have a fine crop of Flax. The characters of well conditioned Flax ſeed, are as follow.

It ſhould be, 1. Of a bright ſhining brown colour.

2. It ſhould not be flat, but thick and plump.

3. It ſhould crackle much when caſt on live coals.

4. It ſhould ſink to the bottom, almoſt as ſoon as it is thrown into the water.

5. In general, the beſt Flax ſeed is produced on ſtrong lands, and in cold climates. Experience has long convinced us, that what is brought from Livonia, is to be preferred to all others; but when this cannot be procured, we muſt make uſe of that which grows on our mountains; for inſtance, on Geſſenai, Haſliland, Siebenthal, Ementhal, Jura, Gros de Vaux, Lengenberg, &c.

What land is beſt for Flax.

All land that is not too wet or too ſtony, and that has not too much ſand or gravel mixed with it, may do for Flax. There are, however, ſome ſoils which may be preferred. The beſt is black earth, neither too ſtrong nor too light, and after having mentioned this, we muſt obſerve, that ſtrong land of what colour ſoever it may be, is to be preferred to light land.

Flax is ſown either in graſs grounds, or worn out paſtures after they are broke up, or in plowed grounds, the firſt or ſecond year after the year of fallow. Some even ſow it in the year that ſhould be fallow, but as this method is ſeldom attended with ſucceſs, we ſhall ſay no more on the ſubject.

In what manner graſs grounds and paſtures are to be prepared for ſowing Flax.

1. Such land muſt by the end of July at lateſt, be turned over in ſmall furrows, either with a breaſt plough or the common plough, cutting about two inches deep; this will cauſe the turf to dry and rot.

2. As early in the month of September as may be, after the turf is dry, a heavy harrow muſt in dry weather be drawn over the field, in order to pulverize the land as much as poſſible.

3. The month following, if your land is not very rich, it muſt be dreſſed with very rotten dung, about ten loads will be ſufficient for an acre. It muſt be regularly ſpread, and in dry weather it ſhould be plowed in, to the depth of at leaſt ſix inches. In this caſe the furrows ſhould be as narrow as poſſible, and ſhould remain open and unharrowed all the winter.

4. In the following ſpring, as ſoon as the ground is dry, it muſt be well harrowed, in order to pulverize the land, and break the clods if there ſhould happen to be any.

5. About the middle of April, which is the ſeaſon for ſowing, the land muſt, in dry weather, be plowed a third time, ſomewhat deeper than it was the ſecond plowing; and if, immediately after this

operation is over, the weather ſhould not be favourable for ſowing, the land muſt the ſame day be harrowed ſmooth.

In what manner land already in tillage, ſhould be prepared, when Flax ſeed is to be ſown the year after the fallow year.

In this caſe, the three plowings uſually beſtowed on the fallow, are to be given, obſerving only, that at every plowing the ſhare goes a little deeper; that the dung ſhould be covered in the third plowing, and that the land lay rough for the whole winter. In the ſpring it is to be managed in the manner above directed for paſture.

The manner in which land already in tillage ſhould be prepared, when Flax ſeed is to be ſown the ſecond year after the fallow.

If the land has been well dunged the preceding year, and is beſide of a good kind, there will be no occaſion to manure it. But as ſoon as the crop of the preceding year is carried off, the land muſt immediately be plowed in ſmall furrows, to the depth of about two inches, that the weeds may not impoveriſh it.

As ſoon as the weeds make their appearance, the land muſt be ſtirred with a pair of the largeſt harrows, and about Michaelmas, it muſt be plowed about ſix inches deep, in narrow furrows, letting it lay rough during the whole winter.

The ſpring following, as ſoon as the land is dry, it muſt again be harrowed, and afterwards laid level with ſmaller harrows, and when the ſeaſon for ſowing comes, it muſt be plowed for the laſt time.

It is neceſſary to obſerve in general, that Flax thrives beſt upon land that has the preceding year borne a crop which ſhaded the ground and prevented the weeds from growing; for this reaſon, there is ſeldom good Flax after a crop of rye.

Pre-

Precautions to be uſed in ſowing Flax ſeed.

1. The quantity of ſeed to be uſed, ſhould be proportioned to the nature and condition of the land, in the broad caſt way, never leſs than two, nor more than three buſhels to the acre.

2. Light lands ſhould be ſown earlier than ſtrong lands, but always when the dread of white froſts is over, and never in rainy weather, when the ground is wet.

3. Be careful to pitch upon a mild day, when the wind is not in the north-eaſt quarter, and when dew may be expected in the evening.

4. In ſuch a mild day, begin if you can, to plow after noon; let the harrow follow cloſe at the heel of the plough. A little before ſun-ſet, as ſoon as you have ſome ground ready prepared, ſpread your ſeed; it is beſt to do it at three caſts. Leave the work in this ſtate till the next morning, when, without fail, the ſeed muſt be covered with a light harrow, or, what is ſtill better, with ſtrong rakes. This method of proceeding is of greater conſequence than may in general be imagined.

5. If the ſoil is inclined to be light, or there is a probability of the ſpring being dry, immediately after the ſeed is harrowed in, let a roller be carefully paſſed over the land; or if the ground is not of conſiderable extent it may be cloſed by treading.

6. If the land was in want of manure, and that you had none proper for the purpoſe in autumn, you may now lay on ſome very rotten dung after the ſowing, when the ſeed has been harrowed in, and afterwards paſs the roller over it.

What manure is beſt adapted to the nature of the Flax.

As every kind of weed is prejudicial to Flax, and as, if there are many weeds, it will coſt a great deal to clean the crop, it is much better to lay on no dung at all, than to apply ſuch as is not well rotted, and at the leaſt a year old. If I had no good dung, I would rather chuſe immediately after the ſeed was in the ground, to ſpread ſoot or aſhes in a ſufficient quantity, and roll the land the better to incorporate the manure with the ſoil. If I could not even procure this manure, it would be proper when the plants were about an inch in height, and in rainy weather, to ſprinkle over them in the evening, hog's urine, cow's urine, or any other ſuch matter, that was not of too hot a nature. The farmer may reſt aſſured, that this laſt-mentioned manure, will have at leaſt as good an effect as ſoot or aſhes, and will produce very few weeds.

In what manner, and when Flax ſhould be weeded.

1. The Flax being grown to the height of about four inches, may be weeded without any fear of damaging it.

2. This work ſhould be carefully executed, but with as much expedition as poſſible.

3. The weeders ſhould always go bare-footed into the field, and ſhould work as much as poſſible ſitting or lying down.

4. Every time they leave off working, they ſhould heap the weeds and carry them away.

5. It is to be obſerved, that at this ſeaſon the wind generally blows from one point; now they ſhould begin to weed at the oppoſite part of the field, that is to ſay, the weeders ſhould always face the wind, by this management the flax will riſe the ſooner.

6. This work ſhould never be done in rainy weather, nor when the ground is wet.

7. If the flax is to be propped, this work is beſt done at the time the crop is weeded.

N. B. To prop flax is to fix ſupporters about the ſize of a man's finger, branched a little at the top, and about three or four feet long, at the diſtance of every yard. If the flax grows to the height of three or four feet, this precaution is indiſpenſably neceſſary, on account of the violence of the winds in this country.

In what manner and at what time Flax is to be pulled.

1. As ſoon as your Flax in general begins to turn yellow at the foot of the ſtalk, it is time to pull it, though the ſeed ſhould not be quite ripe, it will ripen on the ſtalks whilſt they lay on the land.

2. This work ſhould be done in dry weather.

3. If the flax is not all of equal ripeneſs, the ripeſt muſt be carefully picked out; for if it is all graſſed together, that which is not ripe will rot before the other is ſufficiently graſſed.

It is alſo beſt firſt to pull the longeſt, and afterwards the ſhorteſt, and to keep them ſeperately, but this muſt be done all at one time. By obſerving this method, there will be fewer hards, and of courſe more flax, when it comes to be dreſſed.

5. Immediately after the flax is pulled, it muſt be ſpread on graſs ground, or on a ſtubble. The ſeed end of the ſtalk muſt be laid towards the ſouth, that it may ripen the better. This will take a fortnight or three weeks, according as the weather is, hot or cold, wet or dry.

In what manner the ſeed is to be ſeperated, and what is afterwards to be done.

1. When the ſeed is ripe, the flax muſt be tied in bundles; and in dry weather, when the ſun ſhines, it is to be got under cover.

2. That the ſeaſon for graſſing it may not be miſſed, the ſeed ſhould be ſeperated immediately after it is got in.

3. For this purpoſe if you have a large quantity

of flax, the moſt expeditious way is to get it threſhed by one or two men in the following manner.

You muſt make ſome pretty thick beds, the heads of the ſtalks muſt touch the barn wall, and over the feet of the ſtalks, the whole length, a very heavy plank is to be laid, that the flax may not be ſcattered in threſhing. The wall, by confining the threſhers, will prevent them from ſtriking too hard, and thereby damaging the flax. This method is very good, and does not take up much time.

4. If you have only a ſmall quantity of flax, it may be rippled in the ordinary way; but you muſt obſerve not to let them take too large handfuls, as that would ſpoil a great deal of flax.

5. After having ſeperated the ſeed you muſt let it lie in its capſule on cloths, expoſed to the ſun, for ſeveral days, and afterwards you are to keep it in a very airy place, but not lay it too thick, obſerving to ſtir it every two or three days for the ſpace of three weeks. When this is done, you may preſerve it in this ſtate for two or three years, without its being injured in its quality; but flax ſeed being once deprived of its capſule will ſcarcely ever keep above a year.

6. In order to ſeperate the ſeed from its capſule, it is much better to ſend it to a proper mill than to threſh it again, which muſt undoubtedly damage it.

7. After having cleanſed the ſeed as much as poſſible with the fan, it muſt be paſſed through two ſeives; the firſt ſhould have oval holes of the ſhape of the ſeed, juſt large enough to let it paſs. By this means all round ſeeds, and other heterogeneous ſubſtances, unleſs they are very ſmall indeed, will remain in the ſeive. After this has been done, you muſt put your ſeed into another ſeive, with very ſmall round holes, through which the flax ſeed cannot paſs. All the ſmaller ſeeds of weeds will eſcape,

and your flax ſeed will be as clean as you can well make it.

Of graſſing Flax.

After the flax is rippled it muſt again be ſpread on a graſs field, but rather thiner than it was the firſt time, and on graſs that has been mown about a fortnight. On this occaſion it is neceſſary to obſerve:

1. That in dry years the flax ſhould be ſpread, if poſſible, on damp ground, and in rainy years on dry lands.

2. Care muſt be taken never to ſpread it on wet meadows.

3. The flax muſt be carefully turned whilſt it is on the ground, that all parts may come forward alike. If the weather is wet, and there are heavy dews, it muſt be turned at leaſt every other day.

4. It is impoſſible to ſay exactly how long the flax will be in graſſing, this depends on the quantity of dew that falls, the coarſeneſs or fineneſs of the flax, and the heat and cold, dryneſs and wetneſs of the weather: but if in bruſing betwixt your fingers, the top of the ſtalk when it is dry, the harle or bark ſeperates eaſily from the boon or woody part of the ſtalk, and this laſt is not tough but brittle, the flax muſt be taken from the ground, ſet up an end, and as ſoon as it is dry, it muſt, in fine weather and at noon, be tied up in bundles, and carried under cover.

5. If in pulling the flax that which was ripeſt was ſeperated from the unripe, it will be found that this laſt will be ready to take up ſome days before the other.

At what time and in what manner it is proper to brake Flax.

1. The heat of the ſun contributing much to the braking of the flax expeditiouſly and without damage,

it is neceſſary that this work ſhould be done, if poſſible, before autumn, and always in fair and hot weather.

2. On account of the danger from fire, this work ſhould never be done near houſes, much leſs in ſtoves or ovens; and indeed our laws forbid it under a heavy penalty.

3. In this country the beſt way is to dig a hollow place in the earth, two feet deep, three wide, and from twelve to fifteen long, lining it with ſtone; over which, at the height of about four feet, is fixed a griddle, conſiſting of ſmall poles, ſecurely fixed on four or ſix piles, or ſtakes, driven into the ground.

4. In this hollow place, when the weather is fine, a fire is made to dry the flax. The moſt proper fuel for this purpoſe is either charcoal or well dried turf, as well becauſe with theſe an equal degree of heat is more eaſily preſerved, as becauſe they neither of them produce much ſmoke or flame.

5. In ſpreading the flax on the griddle, care muſt be taken to make the beds thin, and to diſpoſe of them in ſuch a manner, that all the ſtalks may dry equally as nearly as it is poſſible.

6. Matters muſt be ſo managed, that the men who brake the flax may receive it quite hot; of courſe a ſufficient number of hands muſt be employed, for by braking the flax whilſt it is hot the work is greatly forwarded, and the flax is, beſide, made cleaner and leſs damaged in the operation.

7. The workman, who brakes the flax, muſt not be permitted to bruiſe it firſt in the middle, nor on that ſide of the brake that is next the handle, but he muſt begin at the crop end of the flax, and on the ſide of the brake oppoſite to the handle; for braking the flax is not effected by dint of blows, but by preſſure; to do otherwiſe, would be taking a great deal of trouble to do miſchief.

8. The parts of the brake muſt not be let too much one into the other, and the under part ſhould be moveable to yield with the more eaſe.

Precautions to be obſerved in beating Flax.

There is little to be ſaid on this ſubject, except that flax, in order to be made fine, ſhould be beat; it is this will clean and make it properly ſupple: but great care muſt be taken not to beat too much at a time. If the flax has been properly graſſed and braked, if it is neither too green nor too coarſe, it may, without any danger, be beat above an hour. It is almoſt unneceſſary to obſerve, that during this operation it ſhould be frequently turned.

An obſervation of great importance reſpecting the hackling of Flax.

As dreſſing of flax, particularly hackling it, cannot be executed by an ignorant perſon, but muſt be regularly learned as a trade, requiring knowledge, dexterity, and long practice, I ſhall not enlarge on it in this place. Yet I cannot but with regret obſerve, that quantities of our beſt flax are ſo ſpoiled by the ignorance of workmen, as to ſell for leſs than half value, beſides greatly injuring the quality of our linnens. It is then neceſſary, that without loſs of time ſuch flax-dreſſers, as are able and expert, ſhould be encouraged to take apprentices, whom they may perfectly inſtruct in their buſineſs; and there is not the leaſt doubt, but that this would be of infinite ſervice to the community, and promote our manufactures.

ARTICLE XXXVIII.

An Experiment to make Potatoes thrive without Dung: by Mr. Tschiffeli.

I Proposed plowing ſeveral times, either in the ſpring or during the ſummer, a piece of ground, containing about half an acre, of an indifferent quality, the ſoil inclining to ſand, intending to apply it to ſome other uſe. The preceding year Saintfoin was ſown in it, but it failed entirely, inſomuch that the perſon who occupied it before me had already cauſed it to be plowed in the autumn of the year 1760. I was on this occaſion willing to try whether by following the directions given by Mr. du Hamel I could get a crop of potatoes from it.

I planted accordingly ſome in ſtraight lines, two feet aſunder, and the plants forty inches diſtant in the rows, plowing the intervals three times in the ſummer, that is to ſay, every ſix weeks.

The plough that was uſed was very light, and without wheels, and with two horſes going one before the other, it was very eaſy to draw two furrows about five inches deep, without much damaging the roots.

My workmen, at firſt, ſmiled at my attempt: the potatoes ſprouted but ſlowly, and did not ſeem to promiſe any great ſucceſs; but after the firſt plowing they got forward, and after the other two plowings were to the full as forward as thoſe of my neighbours, which had been plentifully dunged. Finally, after the third plowing, every one was aſtoniſhed to ſee that the ſtalks of my potatoes, which had not been at all dunged, were freſh and green, when the ſtalks of the others, which had been dunged, were turned yellow, withered, and almoſt dry.

In a word, this piece of ground yielded me in autumn half as many potatoes again as the ſame quantity of land would have done in the ordinary method of planting, and theſe were all of a delicious flavour, without reckoning what were given to the hogs on account of their being either too ſmall, or damaged by worms.

This ſmall experiment will encourage me to adopt the ſame method in ſucceeding years, and in encloſed fields, when they are intended to be fallow, planting them with various roots.

In this manner may we follow the directions given us by Meſſ. du Hamel and de Chateauvieux, without being apprehenſive of any loſs enſuing. The careful huſbandman may always promiſe himſelf ſucceſs by adopting this method, and he will be delivered from the pernicious weeds which now conſtantly infeſt his fallows.

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ARTICLE XXXIX.

An Experiment of ſowing Bere, or Winter Barley, in Autumn, to ſerve as green Fodder for Cattle in the Spring, by the ſame Gentleman.

IN the month of September, 1760, I cauſed two buſhels of Bere, or Winter Barley, to be ſown, intending to mow it in the ſpring, to ſerve as fodder for my cattle. Being informed in the year 1761, that Bere, after being mown at a proper ſeaſon, and before it ſpindles, will ſtill attain a perfect maturity, I left it for ſeed, after having mown it three times, in April, May, and June.

In the beginning of Auguſt I got in fifteen buſhels of excellent full ripe Bere. The fodder I got from it, and which was given to the cows, ſometimes mixed with clover, and ſometimes with Saintfoin hay, appeared to be very ſucculent and nouriſhing.

The ſoil on which this crop grew was of a middling quality, inclining to be gravelly and light, and had in the year 1760 yielded a plentiful crop of ſummer rye.

No kind of manure was laid on at the ſowing of the Bere. The ſucceſs of this experiment encouraged me to ſow laſt September eight buſhels of Bere in the ſame manner, of which I hope to have a good account.

ARTICLE XL.

The Farmer enriched by artificial Paſtures, or the true Application of cultivated Graſſes, ſo as to improve and encreaſe the Value of Land. By Monſieur DE L'HARPE *of Switzerland.*

INTRODUCTION.

MY father's houſe was the ſchool in which I learned all I know of agriculture; above thirty years have I been a witneſs to the very great advantages which may be, and are derived from the well regulated culture of artificial graſſes. All I had to do was to follow the example and attend to the precepts of a wiſe father; I now reap the benefit reſulting from this attention, and am willing to participate with mankind in general this knowledge which has been ſo uſeful to me.

But it may poſſibly be aſked, is there any occaſion for the publication of this treatiſe? Is not more already written on the ſubject than the world approves of? Theſe queſtions I ſay may be aſked, and it would be highly improper ſhould I leave them unanſwered.

The ſeveral works which have been written on the ſubject of huſbandry, furniſh me with an additional inducement for the publication of the preſent Eſſay. Patullo in his treatiſe *Of Improvements*, and Des Pomiers in his *Art of growing ſpeedily rich*, &c. exaggerate matters greatly, and promiſe more than they can any ways make good, more than they ought to do, and in truth more than there is any occaſion for. On the contrary, the Author of the preſervative againſt the pretended *Agromania*, with which people have been ſaid to be infected, ſeems to have a peculiar ſatisfaction in depriving us of every hope of ſucceeding in our attempts to better ourſelves by agriculture. If you follow the inſtructions ſo fully and ſo flattering laid down by the firſt mentioned Authors, it is neceſſary you ſhould have a reſolution, a conſtancy, nay, we may even ſay an obſtinacy of perſeverance, not to be diſcouraged with the firſt reſults of your painful, expenſive, and perhaps tedious experiments, when to your great diſappointment you find your crops ſo much inferior in quantity to what you had been taught to expect, and had moſt probably flattered yourſelf with the hopes of. If, on the other hand, you place an entire dependance on the theory laid down by the laſt mentioned writer, you will be backward in employing yourſelf in any thing that relates to huſbandry; you will leave it to be ſtill engroſſed by the ignorant landholders, who have ſo long tortured the earth with their ſtupid and ill-judged practices, and unconcerned will you perhaps ſee it ſink, unaſſiſted, under the oppreſſive weight of long uſed cuſtoms and idle ſuperſtitions, which cannot conſiſtently with reaſon or experience be defended or approved of.

Yet after all, the advantages which are to be derived from artificial paſtures are conſiderable enough, and ſufficiently obvious, to attract the attention of every man who has only a tolerable ſhare of common ſenſe: for this purpoſe nothing more is neceſſary than to lay them before his view with candour and ingenuouſneſs, without exaggeration, and without any the leaſt diſguiſe or art. This evidently neceſſary taſk has not yet been performed to any purpoſe, and this it is which I ſhall attempt doing in the treatiſe I am about to write.

I ſhall not be content with ſaying that ſuch an extent of land will produce ſuch a ſum of money, ariſing from the ſale of the artificial graſſes which grew on it: this account, tho' given with ever ſo much integrity, would afford but very little or no inſtruction to the farmer; as the produce muſt be greatly influenced by the ſituation of the land, the goodneſs of the ſoil, and many other relative circumſtances.

It is neceſſary, if we would afford the intelligence he is deſirous of having, to ſpecify the ſum of the produce in kind, the quantity and quality of the produce is what he chiefly wiſhes to be made acquainted with, that he may the better be enabled to judge, whether the methods of practice, by which this crop is procured, can with any degree of propriety be adopted by him.

I could, it is true, without much difficulty tell the reader, that ſuch or ſuch a quantity of a particular artificial graſs was the largeſt crop I had known to be produced; but that the common or ordinary produce, on which alone the intelligent farmer ought to depend, taking the crops one with other, amounted only to ſuch a leſſer quantity. And I could add to this account, that with the produce of ſuch crops taken on the average, I could maintain ſuch or ſuch a number of cattle of a particular kind which would be worth ſuch a ſum; and that ſo much would be the clear profit, equally applicable in all places, at leaſt after making, according to circumſtances, certain neceſſary alterations and allowances.

The order in which I ſhall arange the ſubjects of this piece, as they occur, is as follows:

I ſhall in the firſt place give ſome account of ſuch of the artificial graſſes as are moſt commonly and generally cultivated as fodder for cattle. I ſhall enlarge a little on their qualities, point out how far one is to be preferred to the other, deſcribe the manner of preparing the land for the reception of the ſeed, and give ſuch rules for their culture, as I may think any ways neceſſary for the inſtruction of the honeſt farmer.

As it is indiſpenſably requiſite, at leaſt if we would wiſh to derive any advantage from the culture of them, that artificial paſtures ſhould be plowed up in order to their being from time to time renewed, I ſhall point out what intermediate crops of grain the farmer may expect his land will produce him, before he again lays it down in any of the artificial graſſes.

I ſhall in the next place, from the methods I have myſelf long practiſed, give ſome good rules reſpecting the manner in which the farmer ought to manage his land, that is, how he ought to apportion or divide it if he means to follow my method of culture.

I ſhall lay before the conſiderate reader the advantages to be derived from this method, compared with thoſe which farmers in general now reap from the old methods of practice, and from ſuch lands as are kept always in tillage.

I will then fully and plainly demonſtrate, that when my method of huſbandry is once to purpoſe adapted, the advantages to be derived from it are not only greatly ſuperior to what is got by the ordinary practice, but that it is alſo as eaſy and as little intricate for the farmer to follow.

I have another thing alſo to mention, that will perhaps be a ſingular ſatisfaction to our indolent landlords, which is, that the farmer or landholder may occupy his farm, and work it in no very different manner from that which has for ages been practiſed.

I ſhall finally examine the ſeveral difficulties which may be objected, as being inſeparable from this plan of huſbandry, particularly thoſe which are thought to be the leaſt eaſy to obviate.

If I make it appear that every thing I have aſſerted in this introduction is practicable, and muſt turn out to the farmer's advantage, it will, without doubt, be allowed, that this treatiſe may be of ſome uſe; if, on the contrary, I ſhould fail of ſucceſs in this my attempt to benefit mankind, the zeal by which I am actuated cannot but be approved of by the worthy, the diſintereſted, the good natured part of the world.

Critics may and will poſſibly find fault with my putting in the front of this piece what they may eſteem ſo quaint a title; yet can I by no means think it improper, as the farmer muſt needs grow rich if a method is pointed out to him by which his profits ſhall be at the leaſt doubled to him, and that not for a ſhort ſpace of time but for a continuance.

CHAPTER

CHAPTER I.

Of the Advantages to be derived from artificial Paſtures.

IN the Dutch Edition of the memoirs of *Trevoux* for the month of May, 1762, p. 178, I find the following paſſage extracted from a book, call'd, *Preſervatif contre l'agromanie*; a preſervative againſt the Agromania. *Les praries artificielles peuvent être de quelque utilité, mais l'on en a trop exalté les avantages, et il eſt certain qu'elles ne ſont point à comparer aux anciennes*, &c. Artificial paſtures may, poſſibly, be of ſome utility; but the advantages to be derived from them have been too much exaggerated, and it is certain, they are by no means to be compared with the old paſtures, &c.

I acknowledge that the accounts given relative to this matter may very poſſibly have been exaggerated, by giving us room to expect profits which we can at no rate promiſe ourſelves, unleſs our land is very favourably ſituated indeed; as for example, in the neighbourhood of a great town: and it would have been much better, if the quantity alone of the fodder, which the land would produce, had been ſpecified, without ſaying any thing about the value of it.

After having made this confeſſion, I think I may venture to aſſert from my own knowledge and repeated experience, that artificial paſtures may be of great utility to the farmer, and it is but juſtice that I reproach this writer either with being ignorant of the ſubject he writes on, or, what is ſtill worſe by far, with being guilty of groſs and evident partiality, as it muſt on all hands be acknowledged, that he does not afford to the artificial paſtures that juſtice which they abundantly merit; and I do not found this aſſertion on hear-ſay, the report of others, or on accounts which I have read in the works of prejudiced, and, perhaps, in ſome meaſure partial authors.

"When the profits ariſing from my eſtate are increaſed in almoſt a treble proportion (to what I ſhould at any rate be able to receive without their aſſiſtance) by the means of artificial graſſes, and when I have very reaſonable expectations, that this improvement may ſtill be much farther extended. When I ſee that every one who applies himſelf with any tolerable degree of prudence, attention, and knowledge, to my method of huſbandry, reaps nearly, if not quite the ſame benefits from it that I do myſelf, ſhould I do well, or act with integrity, if I expreſſed myſelf after this manner: *Artificial paſtures may poſſibly be of ſome utility to me?* To do common juſtice, ought I not to ſay, *Artificial paſtures are of very great utility to me, and to them do I in a great meaſure owe the eaſe, affluence, and independance which I now enjoy.*"

I ſhall not, till I come near the concluſion of this treatiſe, make any compariſon of my method of huſbandry, aſſiſted by artificial paſtures, with the advantages to be derived from the old faſhioned huſbandry commonly practiſed; it will at preſent be ſufficient to point out two benefits reſulting from this culture, which cannot be conteſted or denied. The firſt is the great increaſe of fodder, the natural conſequence of which muſt in courſe be a proportionable increaſe of all ſorts of cattle, with a diminution of labour. The ſecond is, the great encreaſe in the profits ariſing from a farm, and conſequently the value of the land will be raiſed, as well as the rents to the landlords.

If I had any intention of recommending the breaking up of good meadows, where there is a command of water, in order to their being ſown with artificial graſſes, people might indeed, with ſome ſhew of reaſon, exclaim againſt ſuch ſtrange and out of the way advice, which could not fail decreaſing the profits ariſing from them, making them much more uncertain and precarious than they now are, and involving the farmer in a train of difficulties.

This is by no means my intention, on the contrary, I would have ſuch old paſtures, as yield but even middling crops, left in the ſtate in which they now are, at leaſt for the preſent I deſire not any change to be made in them. Neither do I comprehend the rich lands which lie in the vallies between the mountains, where but very ſmall quantities of corn are in proportion grown, and where the beſt fodder of every kind is to be met with in the greateſt abundance.

Without encroaching in any ſort on ſuch lands as I have been deſcribing, there is ſtill abundant room for cultivating artificial graſſes in the greateſt plenty. How many paſtures, commons, and ſheep-walks have we, which yield ſcarcely any profit, either to the owner or landholder? How much land have we, which when mown, yields not one year with another half a load of hay from an acre? In theſe, if the ſoil is at all ſuitable, the artificial graſſes may to the greateſt advantage be ſown.

It is particularly worthy of notice how ſmall the rents and profits ariſing from ſome lands in tillage are; an amazing number of acres are every year but half tilled, for want of manure to give them proper dreſſings, and cattle to plow them as they ought to be. If this is the caſe, as it really is, ſurely ſome thanks are due to the man who, in diſpenſing with a part of the labour and plowing now requiſite on a farm, ſhall point out to us a method of growing a quantity of grain equal, if not ſuperior, to what we have for many years enjoyed, and at the ſame time inſtruct us how we may be enabled to maintain, without compariſon, a much greater number of fine and valuable cattle? All this may we enjoy by adopting, without delay, the cultivation of artificial paſtures, and for this purpoſe it is that I ſo ſtrongly recommend them to the attention of the farmers. Let a certain proportion of our land be dedicated to them, and leſs of it will be left to plow, yet this leſſer quantity, which of courſe muſt be better tilled, and cannot fail being much better manured, will yield us a larger produce of grain than the whole ever before did.

It may perhaps be admitted, that the quantity will be encreaſed, but then it will be aſked, whether it will be ſo far encreaſed as to pay the rent of the land and the expences of this method of culture. To this I anſwer in the affirmative, if the ſoil is well adapted, and the huſbandry, I propoſe, is carried on in a careful prudent manner. I ſhall mention for example Saintfoin, and all I ſhall ſay on the ſubject will be founded on my own conſtant experience. I do not aſſert that the farmer ſhall get ſuch large crops as I have ſeen on ſome encloſed grounds, where neither plowings nor dreſſings were ſpared, as theſe yielded from three to four loads of Saintfoin from an acre for ſeveral ſucceſſive years; but I can venture to ſay that land of a moderate quality, and which has been pretty well plowed, ſhall yield one crop with another, for ſeven or eight years, from a load and a half to two loads of Saintfoin from an acre.

I may ſafely add to what I have ſaid, that this crop is leſs ſubject to caſualties than the natural graſſes. When once the Saintfoin has taken firm root in the land, it will be injured but in a very ſlight degree by the greateſt drought, ſo that in dry ſummers this plant proves to the farmer a reſource truly valuable, without this help he would ſcarcely know how to ſubſiſt his ſtock, as is too often proved by ſuch as cultivate it: it will, in ſuch ſeaſons, grow in places where it has not been ſown in the memory of man. In the neighbourhood of one of my Saintfoin fields I had a piece of land, where it grew very vigorouſly, and it came up in ſuch plenty after a dry ſpring, that it yielded me more fodder than the natural graſs which it had ſucceeded. In ſaying this I have mentioned an advantage which is almoſt peculiar to Saintfoin; but that I may lay every thing relative to the ſubject in an impartial manner before the eye of the judicious farmer, I ſhall next mention ſome of the diſadvantages attending the culture of this plant.

I acknowledge with the greateſt candour that Saintfoin will not make cows give ſo much milk, cream, &c. as the graſs of rich water meadows; yet is this diſadvantage in ſome ſort ballanced, by its affording cattle plenty of excellent and ſweet nouriſhment, and making them ſoon fit for ſlaughter. I know of no fodder which agrees ſo well with hard working cattle uſed in draft, particularly horſes; my horſes, which ſcarcely ever taſte any other food, do their work with ſpirit and alacrity; and what is of very great conſequence to the farmer, never ail any thing. In the winter ſeaſon I feed my cows with Saintfoin hay, which keeps them always in excellent caſe; and in the ſpring they are almoſt fit to be ſold to the butcher for ſlaughter, being half fat.

I ſhall with equal candour acknowledge another diſadvantage attending the uſe of this fodder, it ſpends rather faſter than hay produced by the fine natural paſtures, at leaſt the firſt cutting of it does ſo; becauſe the ſtalks of the Saintfoin, being harder and of a more woody ſubſtance, muſt conſequently be leſs nouriſhing. This difference in the ſpending of the two ſorts of fodder, I have, in the courſe of my experience, fixed at about one ſixth part; for I find that five hundred weight of the very beſt and fineſt hay, without any mixture of couch, weeds, &c. (I mean not coarſe hay from a low wet meadow) will laſt as long as ſix hundred weight of Saintfoin hay. But I muſt in this matter at the ſame time obſerve, that I am very much inclined to think, that if I had myſelf undertaken the management of my fodder and feeding my cattle, I ſhould have found no difference at all, the difference chiefly proceeding from the waſte made through the negligence and careleſſneſs of the ſervants, who muſt in ſome caſes be truſted.

Yet after all, what conſequences can be inferred from theſe two candid acknowledgments? excepting that the benefit reſulting from the uſing of Saintfoin will be diminiſhed one ſixth part; and when every allowance is made, it muſt ſtill be confeſſed, that the quantity of fodder will be increaſed, and of courſe the number of cattle kept on a farm, if the occupier pleaſes. On the other hand, the work to be done on the farm is leſſened in proportion to the quantity of land that is cropped with Saintfoin, by which means the profits cannot fail being increaſed. I ſhall not juſt now attempt making any calculation, as every farmer muſt be ſatisfied of the truth of what I have advanced by this ſimple expoſition of matters of fact. I now proceed to the ſecond Chapter, in which the reader will probably find ſomething very well worth his moſt ſerious attention.

CHAPTER II.

Of the artificial Graſſes which are moſt commonly cultivated, their ſeveral qualities, the crops they yield, their duration, the choice of ſoil for them, and the ſeveral preparations neceſſary for their culture.

THE various terms made uſe of in different provinces to expreſs the ſame thing, often occaſions a confuſion not eaſily to be got over, and this is particularly obſervable in the names that are given the ſeveral ſorts of artificial graſs. That which the Pariſians call Saintfoin, the inhabitants of Dauphiné name Eſparcet or Eſparcette. As the people of Switzerland firſt procured this plant from the Dauphinois, they of courſe call it by the laſt mentioned name; calling that plant *Sainfoin* which is in almoſt every part of France known by the name of *Luzerne*. This confuſion might eaſily be remedied if farmers would but once agree to call the ſame thing always by the ſame name.

The firſt of the artificial graſſes which I ſhall take notice of, is *Lucerne*, or as we often call it, Saintfoin, with violet or purple coloured flowers. This plant is greatly prized, on account of the quantity of fodder which it yields, for in a rich ſoil it may be cut ſix times in the ſpace of one ſummer; in ſuch a ſoil, an inſulated plant will become as large as a moderately ſized ſhrub; I can at this time, produce ſeveral plants which have roots full as large as the arm of a ſtrong robuſt man. I know alſo by experience, that this plant thrives extremely well, when cultivated according to the principles of the new huſbandry practiſed by M. de Chateauvieux; and they are the plants cultivated in this manner, which have the roots ſo large as thoſe mentioned above. But if the bind-weed once attacks theſe fine plants (which was the caſe with me) they dwindle by degrees, and periſh, ſo that the whole plantation muſt be plowed up. Theſe pernicious weeds cling to the ſtalks of the Lucerne, and choak the plants as they riſe, but the truth is, Lucerne is very impatient of any ſort of weed which grows near it.

Though my Lucerne plants were in a very thriving ſtate, yet the bindweed had no ſooner attacked them than they died, notwithſtanding I cauſed their ſtalks to be immediately cut. Every farmer knows the havock this weed will make amongſt clover. I have found it in the natural paſtures; but not meeting here with the ſupport which it requires, it ſoon dies, and is carried off with the wind. I have ſeen this weed in bloſſom, and with the ſeed ripe; the ſeed is nearly of the ſame ſize as lucerne or clover ſeed, &c. I ſhall in this place remark it once for all, and I ſhall not have occaſion to repeat it when I come to treat of clover, that the beſt way of getting rid of this weed, is to raiſe your own ſeed both from lucerne and clover.

But to return to lucerne: This plant requires a light ſoil; that which agrees beſt with it being a light, rich, ſandy loam, which may not improperly be called the beſt land moſt farms afford; it may therefore be no very eaſy matter to introduce the culture of lucerne in any very extenſive degree. If the farmer has a piece of land within a reaſonable diſtance of his yard, let him ſow as much of it with lucerne as he can water with the drainings of his dunghills, and he will find that the amazing produce of this plant will ſufficiently indemnify him for all the trouble he can take in its culture, and his cattle will have plenty of green fodder during the courſe of the ſummer.

Rye graſs is often ſown with us, and if it is cultivated on a ſtiff moiſt ſoil, the farmer will not have reaſon to complain; but I have not included this plant within my preſent plan, in the firſt place, becauſe we muſt procure our ſeed from abroad, that which we ſave ſeldom ſucceeding; and this makes the culture of it very expenſive. Secondly, this plant yields leſs crops than almoſt any other kinds of cultivated graſs, and when the cattle have taſted any other fodder, they are with great difficulty brought to eat this again. Any farmer who chuſes to do it, may however cultivate this plant, according to my plan of huſbandry, if he will but take care to bear in his mind the time which it will continue with profit on the land, and regulate matters accordingly.

I ſhall in this little treatiſe chiefly confine myſelf to clover and ſaintfoin, as the long experience which I have had in the culture of theſe two plants has given me a perfect knowledge of them.

It is needleſs to give a particular botanical deſcription of them, as they are well known plants; and the truth is, I might acquit myſelf but badly in the taſk.

To begin with clover, I ſhall in the firſt place mention the proper time of ſowing it. The broad clover with red flowers, is the *trifolium pratenſe purpureum*, and is with us (in Switzerland) ſown generally the latter end of April, or the beginning of May in moiſt weather, or when rain is expected in a ſhort time to fall.

Clover thrives beſt on a mild tractable ſoil, rather ſtiffiſh and moiſt than light and dry, and the land ſhould alſo be well manured. It is a common practice after having well plowed and dunged the land intended for clover, to ſow it in autumn with wheat, and the clover is afterwards, in the ſpring, ſown on the green corn; the farmers, not without reaſon, being of opinion, that the wheat plants guard the young clover whilſt it is yet in a weak and tender ſtate, from being ſcorched up by the violent heat of the ſummer's ſun.

The quantity of ſeed to be ſown comes next in queſtion; about eighteen pounds on an acre is ſufficient, and though the ſeed of clover is very ſmall, a little practice enables the country workmen to ſow it very regularly, either by itſelf or mixed with ſand. If the ſeaſon proves favourable, the young clover plants begin to get forward apace immediately after the wheat is carried off the land, and the farmer may expect a ſmall crop even the firſt year. Sometimes, indeed the dryneſs of the weather prevents it from ſhooting with any degree of vigour the firſt autumn, however, the plants nevertheleſs live through the winter, and thrive equally well the ſecond year.

With reſpect to its duration as a crop, it may laſt four or five years; but the roots of clover ſpreading laterally, and running no great depth into the land, the plants become feeble, and the produce is but very indifferent after the third year; beſides, if the clover ſeed ſhould happen to be mixed with the ſeeds of weeds, as all that comes from France is, theſe weeds the third year get to ſo great a head, and propagate ſo faſt, that there is ſcarcely room left for the clover to grow.

My experience on this head prompts me to join in opinion with M. Patullo. If you reckon as the firſt year that in which the clover was ſown, I would recommend that it ſhould be mown for the ſpace of two years; and the fourth year, after once mowing, it ſhould be plowed; whatever plants remain, will ſerve as manure for the land, and be of great ſervice to whatever ſort of corn is afterwards ſown; in following this method, you will be ſure never to impoveriſh your ground.

With reſpect to ſaving the ſeed of clover, I ſhall not enlarge much. The beſt ſeed is ſaved from the ſecond cutting of the ſecond year; and the beſt way is, after determining the quantity of ſeed that will be wanting, to leave for this intent, the parts of the field where the plants are the fineſt, and in the moſt flouriſhing condition. When the flowers are dry, women may be ſent in to cut them with reaping hooks, and carry them directly under cover in cloths; the plants ſhould then be thraſhed in the barn, or what is better ſtill, the ſeed ſhould be ſeparated by a machine for the purpoſe; the caving ſieve and fan will ſerve afterwards to dreſs what ſeed has been thraſhed, and by theſe means the farmer will have as much as he wants, and clean enough for his uſe.

Let us now examine a little into the produce of clover; the ſecond year certainly yields the largeſt crop. It is cuſtomary to cut clover as ſoon as it is in flower, which, in this country (Switzerland) generally happens about the end of May. If the ſeaſon is favourable it immediately makes new ſhoots, and flowers again about the end of July, when it is to be mown a ſecond time, and the laſt mowing is generally ſome time in the month of September.

The three crops of the ſecond year may very well be eſtimated at three tons for each acre of land. The third year there may alſo be three cuttings, which we will eſtimate at two tons per acre. Add to this, one ton and a half per acre for one cutting the fourth year, and for the cutting, which, as I have already obſerved, may probably be obtained the firſt year, and it will be evident, that at moſt eighteen pounds of ſeed will, in the ſpace of three years, have produced on one acre of land, near ſeven tons of fodder. This is more than ſufficient to make amends for the quantity of dung which was laid on, for I always found when I had plenty of litter, that one load of clover hay would yield me at leaſt three good waggon loads of dung.

It will certainly be expected I ſhould ſay ſomething relative to the qualities of this fodder. It cannot be denied, but that clover is moſt excellent food for cattle when it is given to them green, and they are permitted to eat it under cover: but it is to the laſt degree imprudent, ever to ſuffer cattle to eat it on the land on any pretence, and at any time whatever;

too many fatal proofs might be given in ſupport of what I here aſſert.

[This is certainly ſaying too much, but our author was not probably acquainted with the Engliſh methods of huſbandry. He adverts to the danger there is of cattle being blown or hoved, by their being allowed full liberty to graze clover. Our Engliſh farmers, however, know by experience, that there is not ſo much danger in it as ſeems to be here repreſented; ſome care is certainly neceſſary, and with care few accidents happen. Clover is very ſucculent, therefore when it is cut for cattle to eat green, it is beſt to let it lay and wilt a little before it is given to them.]

We muſt beſides remark, that clover requires finer weather to make it into hay than almoſt any other plant; two or three ſhowers of rain falling on it after it is cut ſpoils its colour, making it black; and let this hay be made in ever ſuch fine weather, it will nevertheleſs ſhed and loſe a conſiderable part of the leaves which were on the plant. It is not impoſſible but a remedy might be applied to this inconvenience: ſuppoſe it was to be houſed before it was quite dry, and that it was ſtacked with dry ſtraw in alternate layers, this might probably be found to anſwer.

After all I cannot but be of opinion, that clover hay is not only greatly inferior both to meadow and upland hay, but even to Saintfoin, which is certainly more wholeſome, if it ſhould not even be allowed to be more nouriſhing.

[That clover hay is not ſo ſweet feed as meadow may readily be allowed, but it is notwithſtanding very nouriſhing good food for ſlow drawing horſes, and the only danger is its enriching their blood too much. Farmers are well acquainted with its excellences, and know how much corn it annually ſaves them. No horſes are in better order, or work with more chearfulneſs, than thoſe which are fed on clover hay.]

After having ſaid ſo much on clover, I ſhall now lay down a few rules reſpecting the culture of Saintfoin.

I am very ſenſible that much has been writ on the ſubject, therefore what I am about to ſay may be deemed ſuperfluous. For this reaſon I ſhall confine myſelf to making only a few remarks, which, notwithſtanding all that is to be read relative to this plant in a variety of authors, will, I am opinion, be thought uſeful by many.

To begin then, every ſituation is not equally agreeable to this plant. It prefers light ſoils provided they have a fall. I have ſeen it in a ſickly condition on ſtoney ſoils, lying almoſt flat, when it has at the ſame time thriven well on ſome ſtiff but ſweet lands, which had no greater fall. In general it is moſt ſuitable to this plant to find at the depth of a foot, or a foot and a half, a bed of gravel; but then this bed muſt not run ſo deep, ſo as to prevent the root from penetrating through it to a greater depth in ſearch of moiſture and nouriſhment. I have at this time a field of Saintfoin on ſuch a ſoil, which has already laſted upwards of twenty-five years, and is yet in good heart. By boring to the depth of about ſix feet, you may eaſily judge whether the ſoil of a field is adapted to this plant.

As Saintfoin ſends forth a long tap root, and will not admit of any other plant growing near it, it is abſolutely neceſſary that the land ſhould be deeply plowed, and very well prepared, before the ſeed is ſown. A great deal depends on this, and if the farmer chuſes not to be at this expence, he had better lay aſide all thoughts of ſowing Saintfoin.

The general practice among the peaſants is to ſow three times as much Saintfoin as wheat; but this is a great waſte. I ſow it only in a double proportion; that is on land where I would ſow three buſhels of wheat per acre, I ſow ſix of Saintfoin: and I have at this time ſome growing, which was eight years ago, ſown in this manner, and yet is thick enough on the land.

If a farmer is not certain that his ſeed is good, he had beſt not ſow it; for plants, which come up feebly, like weak or conſumptive children, will either languiſh through life, or be choaked by the graſs which will eagerly preſs to conſume the nouriſhment which was not intended for its uſe.

With reſpect to the moſt proper times of ſowing farmers differ much in opinion.

If the ſpring is tollerably moiſt, Saintfoin will ſucceed very well ſown at that ſeaſon of the year with oats; but it is much the beſt way not to run the riſque of a dry ſpring, and to ſow it ſometime in the month of Auguſt.

A great deal depends on the time in which the ſeed ſhould be ſaved.

Experience confirms it to me, that Saintfoin grows more vigorouſly if it is ſuffered to ripen its ſeed the firſt year. It is my conſtant practice ſo to do; in the other years I ſave the ſeed in patches, where the plants ſeem to be in the moſt flouriſhing and thriving condition; and this method of acting always anſwered extremely well with me.

My method of ſaving Saintfoin ſeed, which follows, is neither expenſive nor difficult in the practice.

When the huſks of about half the ſeeds are changed to a colour inclining to grey, I cauſe my Saintfoin to be mown before the dew is off the ground in the morning. The workmen muſt be very careful, mowing it with a ſmooth even ſtroke, without jogs or jerks, and with cradles to their ſcythes, that the heads of the plants may all lay one way.

When it has had three or four hours ſun, it muſt be gently turned.

The next day, as ſoon as the dew is diſperſed, your workmen may overrun the ſwarthes, being firſt provided with cloths fixed to ſlight frames. There muſt be three workmen to every cloth; two of them take up the Saintfoin gently with their forks and lay it on the cloth, beating it with the back of the forks; they turn it and beat it again, throwing it afterwards aſide. The other workman, (but this may be a woman) follows with a rake, and, as ſoon as the two firſt have taken away the cloth, rakes the ſcattered ſtraw up to the heap they have made.

When the cloth is fully charged with ſeed, duſt, and chaff, it is emptied into ſome proper receptacle prepared for the purpoſe, and a fourth workman carries it in a cart or waggon into the barn, where it is dreſſed and cleaned when occaſion ſerves beſt to do it.

Theſe three workmen, excluſive of the carter, can threſh in this manner above three good waggon loads of Saintfoin in a day, and, according to its yield, will get in from fifty to one hundred buſhels of ſeed; this, conſidering the price at which Saintfoin ſeed ſells, is well worth the farmers while to do.

The loſs in the article of fodder is not ſo much as may be at firſt imagined, for though what has been threſhed in this manner is rather hard and ſticky, yet the horſes and oxen will readily eat it, as well as the duſt and chaff which was carried into the barn with the ſeed.

I recommend this method of ſaving Saintfoin ſeed as the very beſt I have any knowledge of.

As ſome who cannot have much experience in the matter have publiſhed things to the diſadvantage of this plant, I think it neceſſary to obſerve in this place, that there is no kind of cultivated graſs which dries ſo readily as Saintfoin, or that is leſs ſubject to turn black, or to heat in the ſtack.

That I may not be in danger of loſing the ſmall leaves, which I eſteem the moſt precious part of the plant, I generally take care to gather it for carrying before it is over dry, and I never, in all my practice, had a ſingle ounce of this hay which my cattle refuſed to eat.

Every experienced farmer being ſenſible that this plant is not ſo full of ſap as many others, will perceive that what I ſay muſt neceſſarily be true.

I have already mentioned, in the firſt Chapter of this ſhort treatiſe, what quantity of this fodder may be expected one year with another for the eight years which I allow it to occupy the land; there is not the leaſt doubt but that this plant would remain longer in ſoils beſt ſuited to its nature, and if ſome degree of occaſional culture was beſtowed on it. But generally ſpeaking, where a conſiderable number of acres are laid down with it, this term of eight years cannot with any degree of advantage be prolonged; I am therefore of the ſame opinion I firſt declared myſelf, and my own experience confirms me in it.

It would be very eaſy for me to write a volume on the ſubject of the culture of Saintfoin; but I am not fond of repeating what others have with propriety and accuracy ſaid before me: my readers muſt therefore excuſe my not entering into a longer detail; and I ſhall now in the next place endeavour to lay the ground work of my plan of improvement.

[*To be concluded in our next Number.*]

FOREIGN ESSAYS, &c.

NUMBER V.

The Farmer enriched by artificial Paſtures, or the true Application of cultivated Graſſes, ſo as to improve and encreaſe the Value of Land. By Monſieur DE L'HARPE *of Switzerland. (Concluded from our laſt Number.)*

CHAP. III.

Of the Neceſſity there is of forming a new Plan of Huſbandry: The Principles of this Plan explained.

IT has been a great hurt to agriculture, that farmers have not docility enough to vary their crops in a proper manner.

Our anceſtors laid down ſuch a plan of huſbandry, as was conformable to the intelligence they could in thoſe times acquire, but the ignorant cultivators of our age, know not how to make uſe of the helps that are afforded them. A few patches of ſaintfoin or clover are ſown here and there, theſe are mown till they will ſcarcely yield any thing; they are then frequently plowed, without the farmer's knowing why or wherefore, for he is at a loſs what to do with an exhauſted ſoil, which is almoſt totally impoveriſhed.

This negligence is attended with many inconveniencies, for ſuch muſt naturally be the conſequence of this miſmanagement?

In the firſt place, the farmer after having had plenty of fodder for his cattle, is ſuddenly deprived of a conſiderable part of it; whereas had he regularly replaced the pieces of clover or ſaintfoin as faſt as they declined, with others newly ſown, he would every year have had nearly the ſame quantity of fodder, and his farm would have been always in the ſame ſtate of improvement.

In the ſecond place, it muſt be admitted, that ſome particulars who occupy their own eſtates, make a greater advantage of them, even by the unhuſband-like manner in which they ſow ſaintfoin and clover. We do not ſee, nevertheleſs, that the bulk of the people, particularly the farmers who occupy the moſt conſiderable tracts of land, apply themſelves to this huſbandry, they have no taſte for it; if, for example, we let one of them ſome pieces of land ſown with ſaintfoin, for want of proper care, it is either not replaced at all, or it is done in a very injudicious manner.

Thus all that can be done in this reſpect, is to little or no purpoſe, the lands do not produce the crops which might reaſonably be expected from them, neither are they of ſo much real value in ſale as they ought to be.

I make ſuch a ſum annually of my eſtate; yet if I ſhould be under a neceſſity of letting it at the end of three or four years, it muſt be for a rent not exceeding half that ſum, and if I am inclined to ſell it, I ſhall ſcarcely get ten years purchaſe *(in Switzerland)* for it.

It is then certain, that all we have been hitherto able to ſay, write, or prove by the moſt clear reaſoning,

ſoning, has been of little efficacy, and that the moſt difficult taſk yet remains to be performed, namely, to apply to the plan of huſbandry I recommend, all that has come to my knowledge on the ſubject of artificial paſtures, and for this purpoſe to change, if there ſhould be found any neceſſity of doing it, entirely all our ancient cuſtoms.

Some may object that this cannot eaſily be done, yet I aver, that this alteration, or rather entire reform in our huſbandry, is not only indiſpenſably neceſſary, but may alſo very eaſily be put in practice. Why ſhould not we, as our anceſtors did before us, plan a method of huſbandry, conformable to ſuch truths as are well known to us? Our peaſants, our ordinary huſbandmen, well know how to keep their corn lands in three courſes, according to the old cuſtom, are not they then able to count beyond that number, and if inſtead of three courſes, we ſhould recommend to them ten or a dozen, muſt we neceſſarily ſuppoſe that number to ſurpaſs their comprehenſion? Suppoſe the inſtructions given them ſhould import, that *ſuch a year, ſuch a ſmall quantity of land ſhould be broke up, and ſuch another ſown in ſuch a manner with ſaintfoin, and with ſuch a quantity of ſeed.* I cannot but be of opinion, that if they are inclined to it, they may very well put in practice what has been laid down to them in a manner ſo very plain and explicit. The ſame may be ſaid of clover, or any other cultivated graſs, which may be found uſeful or advantageous for the farmer to ſow.

I admit, that the farmers will not of their own accord introduce theſe alterations, if another is to reap the profit of them; but if the proprietor of the land cannot afford to introduce theſe alterations at his own expence, before he lets the farm, ſo that the farmer may have nothing to do but to continue or imitate the methods he ſees already ſo properly brought into practice, if the proprietor, I ſay, cannot do this, he can certainly explain to his tenant the method of huſbandry he would wiſh him to follow, and at the ſame time advance money to pay ſome expences attending this method, which are indiſpenſably neceſſary, or if he does not chuſe to do this, let him engage that his tenant, if he will introduce the courſe of huſbandry here recommended, ſhall for a certain number of years, enjoy all the benefit reſulting from the improvement, at the ſame time diveſting himſelf of the power of raiſing the rent of the farm during that term.

I could wiſh that the method I am about to recommend, may be carefully attended to, and I am fully convinced, that it may every where be carried into execution; at leaſt if there are any obſtacles to its progreſs, they are not ſuch as nature, but human policy has thrown in the way, and which it is not my buſineſs to attempt to remove.

Before I explain my method of huſbandry, it may very reaſonably be required of me to lay down the principles on which I mean to found my plan; it will then eaſily be ſeen whether they are true, and they may either be brought to greater perfection, or altered according as circumſtances may vary, by applying them to other cultivated graſſes.

The neceſſity of the farmer's having a certain quantity of fodder for his cattle, I lay down as my firſt principle, hence I infer, that fodder is the life and ſoul of agriculture, for without fodder we can have but little dung, and that of a very inferior quality, conſequently all goes on in a languiſhing feeble ſtate.

If there are countries fertile enough to produce large and ſucceſſive crops of corn, without the aid of dung, I write not for the benefit of the fortunate poſſeſſors of them, but the truth of my principle will ſtill hold good with reſpect to my lands, and thoſe of my neighbours.

My ſecond principle is, that fodder ſhould be procured by the farmer, in preference to every other crop, at leaſt in the quantity he has occaſion for; my firſt principle being as I have already obſerved, that fodder is the life of farming, putting all things in motion.

I am ſenſible that if fodder was to be raiſed on all our lands, the price of it would of courſe be greatly reduced, therefore as the ſale of this commodity is not comprehended within the extent of my plan, I muſt explain this principle by that which immediately follows, namely, by mentioning what quantity of fodder the farmer ſhould endeavour to procure himſelf.

This leads me to the third principle. It will be proper to have as much fodder as will be neceſſary to raiſe as large a ſupply of dung, as can with propriety and profit be laid on the land: and this quantity of dung is not ſo ſmall as ſome may imagine, as the farmer might annually with advantage to himſelf, lay on his lands in tillage, double the quantity of dung to what is now in general allowed.

The fourth principle gives ſome inſight into the nature of my plan of huſbandry, as I aſſert it is very advantageous for crops of corn and of cultivated graſſes to follow each other, both being by that means encreaſed, or in other words, the firſt crops of grain which ſhall immediately follow cultivated graſs, properly broke up, will be better, ſuppoſe the land to be in other reſpects prepared in the ſame manner, than if the land which produced them, had before borne nothing but corn; and in the ſame manner the crops of the cultivated graſſes which follow corn, on land properly prepared, will be better than if they were ſown after graſſes of the ſame nature with themſelves.

It is well known, that the turf of paſtures when turned down by plowing, by rotting forms an excellent manure. If to this, a few loads of dung, ſuch as is uſually laid on lands when they are ſown, are added, the farmer may expect a much larger crop of corn, he has more ſtraw, and the ſame quantity of ſtraw yields more corn, and of a better quality.

The benefit is nearly the ſame after clover, ſaintfoin, lucerne, &c. in proportion to the number of plants which are left on the land; for if we ſuffer them to die, if we ſtay till there are ſcarcely any plants left, this ſuperiority in the crops which we might otherwiſe have expected, vaniſhes and comes to nothing.

On the other hand, before any ground is laid down in cultivated graſs, it ſhould firſt be well tilled and manured, till it is brought into as good heart as when it was firſt plowed; twice or thrice plowing, nay all the plowing that can be given in the ſpace of a year, will not be ſufficient; this point is not gained, till after it has been cultivated ſeveral years, has been well dreſſed, and of courſe has produced ſeveral crops of corn.

All I have here advanced, I have myſelf ſeveral times experienced, without having once met with a diſappointment; I can even venture to appeal in this caſe, to the judgment of all intelligent and experienced cultivators.

If they will reflect a little on what I have ſaid, they cannot but be convinced, that experience ſpeaks in my favour, being abſolutely on my ſide of the queſtion, and that my fourth principle is entirely well founded.

But this fourth principle well and maturely conſidered, naturally leads me to draw the following inference, from what has been already ſaid.

"As I principally intend firſt to have a large quantity of fodder, and afterwards a great deal of corn, I ſhall certainly, with the help of cultivated graſſes, make a conſiderable advantage of my land, if I alter the courſe in which they are at preſent huſbanded, ſtill bearing in mind the particular kind of graſs which will produce moſt profit, the time this graſs will continue on the ground, and the tillage the land requires to reſtore to it that *aptitude*, if I may be allowed ſo to call it, which it originally, and by nature, had to produce the graſs in queſtion; all theſe things duly conſidered, I apportion my land accordingly.

And as in the common practice the land is divided into three portions, becauſe it requires three years to return to the point at which we begin, ſo I divide my land into as many portions, as I allow years to the growth of the graſs in queſtion, and to the corn which follows it; or to expreſs myſelf perhaps more intelligibly", *The number of portions into which the land is to be divided, ſhould be equal to the number of years allotted for the duration of the cultivated graſs, whatever it be, and the crops of corn which immediately follow it.*

Thus for example, if we mow ſaintfoin for eight years ſucceſſively, and allow the four following years, either for the growth of corn, or for tilling the land, the diviſion here ſhould be into twelve portions.

But to ſucceed in this matter, we muſt pre-ſuppoſe that the farmer is well acquainted with the nature of the ſoil which he occupies, for that is firſt to be conſidered, and I confine myſelf to that kind of graſs or fodder, which will ſucceed beſt with me.

It may happen, that one part of my land is beſt adapted to produce a large growth of clover, whilſt on another part, it may be more advantageous to ſow ſaintfoin. In this caſe, I very readily make two ſeveral diviſions of my land, allotting one for clover, and the other for ſaintfoin, becauſe clover will afford a quantity of excellent fodder, to be given green to my cattle, and ſaintfoin is moſt ſuitable for making hay, to be kept for uſe in winter.

The next neceſſary piece of knowledge, is the time which the graſs I cultivate will laſt; I endeavour therefore to inform myſelf, how many years it will laſt on my land, yielding me all the time reaſonable crops.

With reſpect to the duration of clover, it differs not much on the different ſoils, but this is not the caſe with ſaintfoin. In ſome ſoils, it will ſcarcely uphold itſelf four or five years, whilſt in others, it laſts ten, fifteen, twenty, or more years.

In what manner then are we to judge of its duration, without having had experience of the ſoil?

To this, I anſwer, that if the upper coat of earth is only moderately ſtrong, if a ſtiff clay is not immediately under it, at a ſmall diſtance, but lays two or three feet deep, if there is a ſufficient fall to carry off the water, that it may not remain ſoaking on the land, I ſay, that if with all theſe requiſites, the land is properly prepared for the reception of the ſeed, we may aſſure ourſelves that the ſaintfoin will live on it, at leaſt ſeven or eight years, and that the laſt years crops will be very well worth mowing.

I muſt next acquaint myſelf, with the beſt method of bringing my land again into heart, after it has been under the cultivated graſſes. If it has borne clover, I am to conſider, that it has been on the land only two or three years, and when I come to turn it up, I ſhall find that two or three plowings will entirely conſume the few remaining plants, if I therefore keep it two or three years in tillage, it will be fully ſufficient.

But I muſt allow, at leaſt, one year longer of tillage, to land that has been in ſaintfoin, becauſe having laid a much longer time without culture, the ſoil will ſtand more in need of being reduced, as the ſaintfoin plants which remain, and the natural graſs which has intruded, will not be ſo eaſily conſumed, and this is the reaſon why the land ſhould be more frequently plowed, that the ſoil may be reduced into fine particles.

It muſt be obſerved, that whilſt the land in theſe intermediate ſpaces of time, is under the plow, it muſt be recruited with ſufficient quantities of dung, as I ſhall hereafter note, and the encreaſed crops of corn, will amply repay the expence of the operation.

My principles are of a very general nature, and a great latitude is allowed. It is not my intention, that every farmer whoſe lands happen to be of the ſame nature, ſhould confine himſelf to the ſame manner of dividing or apportioning them.

Though my principles evidently carry with them conviction, yet when they are put in practice, or applied to uſe, ſome degree of modification may be admitted. Thus it would be no inconvenience, or at leaſt very little, if inſtead of dividing the land for ſaintfoin into twelve portions, the diviſion ſhould be reduced to eleven or ten parts.

If the method I here recommend is practicable, which the reader ſhall be convinced of, by the time he has read this entire treatiſe, it muſt be allowed, that it tends towards enabling the farmer to make the moſt of his cultivated graſſes, improving land, not for a ſhort ſpace of time, but for a continuance, and even enriching all the land owners, who may approve of, and adopt the plan.

It is of little conſequence to the reader, whether I borrow or not, the idea of this method of huſbandry from any other perſon; with a ſmall ſhare of penetration, he will find that I am indebted for it to no one; that I pen ſuch thoughts as are my own, and recommend practices which I have myſelf long experienced, to be worth attention. He will moreover, perhaps, find more clearneſs and ſolidity in my reaſoning, and weight in my proofs, without any of thoſe exaggerations, to be too frequently met with in the greateſt part of the modern treatiſes on the ſubject of agriculture.

It will now be neceſſary to explain the manner in which we muſt proceed, to bring land into this order of culture, and to preſerve a regularity in our method, when this is once obtained, and this will ſoon be done; but I hope I ſhall ſtand excuſed, if I afterwards digreſs a little, to ſhew how much ſuperior my method of agriculture is, to that which is in common practiſed.

I have a natural love for a method which I can call my own, and whilſt this love does not carry me any unreaſonable lengths, I may ſurely, in ſome degree at leaſt, be permitted to indulge it.

CHAPTER IV.

Method of reducing Land into this Mode of Culture, and keeping it regularly in it.

This chapter has two objects in view, both one and the other equally eaſy in practice. The firſt alone, requires ſome degree of attention and patience.

As ſoon as the farmer, who approves of, and is determined to adopt my plan, is in poſſeſſion of land which can be adapted to this culture, he muſt begin by finding out what cultivated graſs for fodder, will beſt ſuit the nature of his ſoil, and the number of years it will laſt to profit.

Let him then at his leiſure, and not with hurry lay his plan of operation, regulating his conduct according to his particular convenience.

Suppoſe for inſtance, he determines in favour of ſaintfoin, and that his farm will not conveniently admit of being divided into twelve portions, nothing then need prevent his making but ſix portions, provided that the operation of laying down one piece in ſaintfoin, and plowing up another for ſowing corn, is only practiſed on each double portion every two years.

Meadow, and even tolerable paſture lands, are excepted in my plan, as I have already obſerved at the beginning of this treatiſe. I comprehend within it only lands in tillage, and ſuch bad graſs lands as will ſcarcely pay for mowing the crop.

Having computed the quantity of this ſort of land, a calculation muſt be made of what is to be ſown every year, either in clover or ſaintfoin.

This calculation, and the diviſion of the land, ſhould be laid down upon paper, for the ſake of being more exact and to help the memory.

Write thus for inſtance: Sowed with ſaintfoin, the piece marked with the letter A, in the year 1763. That marked with the letter B, in the year 1764, and thus of the remainder, till you come to the twelfth piece marked with the letter M, for the year 1774.

To this account, add the year in which every piece ſhould be turned up, for inſtance, the piece marked A, in 1771, to be again ſowed with ſaintfoin in 1775.

I would not have the honeſt farmer ſtart, becauſe twelve years are neceſſary to compleat this plan, and that for the following reaſons.

1. As by this means all extraordinary expence will be avoided, except what will be neceſſary to purchaſe ſaintfoin ſeed the two firſt years.

2. The other parts of the land, may, in the mean time, be cultivated after the old manner.

3. With ſome additional expence, this term of twelve years may be curtailed one half, by ſowing every year two parts, ſo that at the end of ſix years, the whole will be cropped; afterwards, all that is neceſſary to be done, is to plow up each part ſeparately, and as the laſt would remain twelve years in ſaintfoin, they might be plowed up one two or three years before the end of that term.

After all, it is not incumbent on me to lay down every thing in ſo preciſe a manner; I muſt neceſſarily ſuppoſe the farmer to have ſome forecaſt and attention to his buſineſs, or it is vain for him to follow it.

4. If the land is divided into ten portions only, the wiſhed for end will be ſooner attained.

I would have the farmer take notice, that the working his land will be inconvenient to him, if the pieces which he is ſucceſſively to ſow, are not contiguous; when the work is laid out in this manner, it is done with great eaſe.

The farmer who would wiſh to inſure to himſelf ſucceſs in this method of huſbandry, will alſo do well not to depend too much on thoſe writers, who aſſert that they have had large crops of ſaintfoin on poor land, without dung, and almoſt without any previous tillage. I would much rather recommend it to him to bring his land into as fine a tilth as poſſible, to plow deep, to divide the particles of the ſoil by breaking the clods, to deſtroy all the weeds and graſs, and finally, to give it a good dreſſing of ſuch dung as he has carefully ſaved for ſeveral preceding years.

By this method of proceeding, the young plants of ſaintfoin will ſoon become vigorous and luxuriant enough, to defend themſelves againſt the natural graſs, and other weeds, which are commonly fatal to their growth: having thus become vigorous, and having puſhed their tap-root deep into the boſom of the earth, they will remain for a much longer time than they would otherwiſe do, in full perfection and bearing.

Having ſaid ſo much on ſaintfoin, it will not at all be improper to reſume the ſubject of clover, and point out the method in which the land is to be apportioned for the growth of this plant.

I have already obſerved, that clover is not to be neglected, if the farmer is poſſeſſed of a ſoil well adapted to its ſupport and nouriſhment.

Divide then the land which you intend for clover, into five or ſix portions, by which means, you will allow three years for the growth of the plant, and two or three years for tillage, or the growth of corn after it is off the land. Lay down this ſcheme alſo on paper.

For my own particular part, I prefer dividing the land into ſix portions, becauſe I by that means get a crop of corn the more, at the ſame expence, or at leaſt with very little addition.

I would alſo recommend, that the land be well dreſſed with dung, for the crop of corn that is ſown the year before the clover is to be ſown, this is the common practice with the farmers in this part of the world, and I much approve of it, though in doing ſo, I differ in opinion from ſome writers on the ſubject of agriculture.

With reſpect to the time of ſowing the clover-ſeed, I alſo conform to the ordinary practice of the country; that is to ſay, and indeed I ought before to have mentioned it, I ſtrew the ſeed amongſt the young corn the latter end of April, or the beginning of May.

But it may be aſked, in what manner ſhall I contrive to continue this method of culture on my land?

I anſwer with regard to clover, that after it has yielded crops for two entire years, and been mown once about the end of May the year following, it ſhould be immediately plowed, and after ſix, ſeven, or eight weeks, plowed a ſecond time, and, laſtly, it ſhould get a good dreſſing of dung, and be plowed for ſowing wheat, rye, or any other winter corn.

The following year let it be plowed immediately after harveſt, and for the ſecond crop ſow turneps, &c. or wait till autumn and ſow vetches, winter barley or bere; or in the ſpring ſow barley, &c.

[It may be proper to obſerve, that in Switzerland their harveſts are forwarder than ours, being got in in July, in which month our author would have the turneps ſown.]

Immediately after the ſecond crop is off the land, let it be again plowed, if you poſſibly can, let it have a ſecond plowing in four or five weeks, give it afterwards a thorough good dreſſing of dung, and then ſow it in the beginning of the month of October with the beſt wheat, that the clover ſeed may be ſprinkled on it the following ſpring.

By this management, in the ſpace of two years and four months, your land will have been plowed eight, or at the leaſt ſeven times, it will have had two good dreſſings of dung, and though it will have yielded you three crops, reſt aſſured it will be greatly improved.

Can any thing be more eaſy than for the farmer to continue this plan of huſbandry in the manner I have laid down?

I muſt once more repeat, that the portions or parts, into which the land is to be divided, ſhould be quite diſtinct and plain, and that the farmer ſhould note down in writing, *in ſuch a year ſuch a portion or piece of clover is to be plowed up, and ſuch another piece is to be ſown in clover; every piece ſhould be managed and huſbanded in ſuch and ſuch a manner.* If the farmer is careful to make this note, either on the paper in which he made the general allotment of his land, or in a ſeperate paper, he will be thereby enabled to carry on his buſineſs in a regular manner, without trouble or fatigue to himſelf, and if he cannot, I muſt pronounce him but one degree from a natural.

The ſame is to be ſaid with reſpect to ſaintfoin, though the method is not quite the ſame, it is, nevertheleſs, as eaſily carried into execution.

I could, as I have recommended in the caſe of clover, turn up my ſaintfoin lays in June after having taken one cutting; but I rather chuſe to treat them like worn out paſtures, becauſe towards the end of their term of duration, they have nearly as large a portion of graſs on them as ſaintfoin.

Thus in the eighth year, for inſtance, if my ſaintfoin was ſown in Auguſt 1755, I have it turned up in the autumn of 1763, with a good and ſtrong plough, making the plowman go as deep as he can, and as the ſoil will allow.

In the ſpring following, after paſſing the drags over it, I ſow it with oats, which I harrow in; and by the time the oats are off the ground, I find that the ſaintfoin roots are thoroughly rotted and conſumed.

I generally have a large crop from theſe oats: after they are got in, I plow the land two, or if poſſible, three times, give it a good dreſſing of dung, and ſow it with wheat; then, without ever letting my land lay fallow, managing in the ſame manner as I mentioned in treating of clover, I get two other crops ſucceſſively.

Immediately after the laſt crop is off the land, I plow it, and in a month afterwards, or about the end of Auguſt, I plow it again for ſowing ſaintfoin.

A few remarks in this place may not perhaps be deemed amiſs.

1. If I lived in a colder climate, I ſhould ſow my ſaintfoin at the firſt plowing after harveſt; for it is neceſſary that this plant ſhould have acquired ſome degree of ſtrength before the hard froſts come on.

2. Of theſe two plowings the laſt is to be ſhalloweſt, leſt the ſtubble ſhould be brought to the ſurface by the point of the ſhare.

3. Some farmers, I am acquainted with, ſow their ſaintfoin with the laſt crop of wheat, but I am as yet unacquainted with what ſucceſs they have had; I ſhall, however, make the experiment, tho' I am inclined to think that this method will greatly encourage the growth of the natural graſs.

But to return once more to the important part of my ſubject, the reader will perceive that I have, by this management, four ſucceſſive crops of corn, the firſt of oats.

I will not pretend to ſay, that after theſe crops my land will be in heart good enough to ſow on it Lucerne, or other plants, which require a very rich ſoil; but it will, however, be in condition good enough to ſow it again with ſaintfoin.

What is there then in this plan of huſbandry which can poſſibly be deemed impracticable, or even difficult, by the reflecting farmer?

The ſaintfoin which he ſows in 1765 will be plowed up in 1773. In the ſpring of the year 1774 he ſows the land with oats, the ſame autumn with wheat, or ſome other winter grain, he will then have two more crops, and in 1777 it will be again laid down in ſaintfoin.

When your land is brought into this order of culture, it is ſurely very eaſy to make a note, as I recommended in the caſe of clover, *Such a year I am to break up ſuch a piece of ſaintfoin, and ſow ſaintfoin on ſuch other piece, &c.*

But after all, I am very ſenſible this queſtion will not fail being aſked: Is there any conſiderable profit to be got by thus changing our methods of huſbandry? That there is much to be got by it, I ſhall endeavour, if poſſible, to convince my reader.

Chap. V.

Shews how much this Culture is ſuperior to that generally practiſed.

I ſhall not take up the reader's time by eſtimating the gradual encreaſe of profit which will accrue to the farmer, from the firſt year when he takes up this culture, to the time when he practiſes it in its greateſt latitude. I am not, at preſent, ſufficiently at leiſure to make this calculation, it will therefore be fully ſufficient, if I lay down the advantage which may be reaped from this method of huſbandry, when all the pieces are in full bearing, and compare it with what ſuch land now produces; this compariſon will lead me to the point at which I wiſh to arrive.

In making this compariſon, I except, as I have already obſerved, all meadow land or rich paſtures.

In order to bring this matter more fully within the reader's view, I ſhall ſuppoſe this huſbandry practiſed on a farm of ſixty acres, and after allowing a reaſonable and proper ſum for the value of the produce of this farm one year with another, I ſhall try if more might not be made of the ſame land, by adopting my plan of huſbandry, and planting it with clover; I ſhall then examine what ſuperior advantages reſult from adopting my plan in relation to ſaintfoin.

I muſt ſuppoſe the ſoil of this farm to be of a moderate quality, capable of affording nouriſhment, with good management, to a crop of clover, It would be very difficult to aſcertain the value of the ſeveral parts of the annual produce of this farm, and to allow for all the articles of expence which are of courſe to be deducted from the clear gain, or from what is to maintain the farmer and his immediate family; I ſhall therefore go a ſhorter way to work, and ſuppoſe the rent of this farm to be thirty pounds a year, that is ten ſhillings an acre, and I will ſuppoſe alſo, that when wheat is nine pounds per load, that the farmer makes three rents of the groſs produce of his land, one of which is to go to the landlord, the ſecond to pay the expences of huſbandry, pariſh rates, and other incidental matters, and the third to go to the ſupport of his family.

Theſe ſuppoſitions will, I ſuppoſe, very readily be allowed, as the profit of farming, in the old way, is generally eſtimated at what I have mentioned, or nearly ſo at leaſt.

We may now ſtop a-while, and ſee how the account will ſtand in this common way of huſbandry; it will doubtleſs be as follows:

		l.	s.	d.
Three rents of ſixty acres, at 10 s. per acre, amounts to		90	0	0
From which deduct				
For the landlord one rent	30 l.			
For defraying the expences of culture, manure, black-ſmith, plow-wright, pariſh taxes, tythes, and other incidental charges, a ſecond rent	30 l.	60	0	0
	60 l.			
Remains to pay the farmer for his trouble & maintain his family, the third rent, namely		30	0	0

Let us now ſee what this land would produce, ſuppoſing it to be cultivated after my manner with clover, in different portions or allotments, and ſuppoſing the plan of huſbandry to be fully perfected.

Theſe ſixty acres of land will be divided into ſix equal portions, of ten acres each; of which portions there will every year be two in full bearing of wheat.

	l.	s.	d.
Suppoſe theſe two portions, or twenty acres of wheat, to yield, one with another, a crop of twenty buſhels per acre, and that wheat is at nine pounds per load; on this ſuppoſition, which is far from being unreaſonable, the whole crop will amount to four hundred buſhels, or fifty quarters, or ten loads, which at the above prices comes to	90	0	0
Though turnips, winter barley, maſlin, or the ſeveral ſorts of ſpring corn, which may be ſown as a ſecond crop, yield a good encreaſe, yet there will be only one portion of land allowed for whichever of them is ſown; we will ſuppoſe it Barley, and that the ten acres produce forty quarters, this cannot be eſtimated too high, if we ſay it will fetch	30	0	0
Two other portions, of ten acres each, will have on them full crops of clover; as this may be cut twice within the year (in England we mean) it cannot be thought much if we eſtimate the crop of the 20 acres, one with another, at two loads an acre, which at 20s. per load amounts to	40	0	0

	l.	s.	d.
There will be clover on two other portions, that is to ſay, the firſt cutting of the portion which is to be plowed up and what will have grown on the piece ſown that year; but as the laſt will ſeldom (in England) be worth mowing, we ſhall reckon only the firſt at one load per acre, which at the price abovementioned comes to	10	0	0
In the above eſtimates I might reckon the value of many other articles, as of ſtraw, rouens, the feed of ten acres of clover for the firſt autumn after it is ſown, &c. however, as ſome may imagine I have already eſtimated the firſt mentioned articles too high, which in truth I have not, I ſhall ſet down for them	0	0	0
The ſum total then of the whole of one year's produce of this farm cultivated after my method will be	170	0	0
From this take the ſuppoſed produce in the method named three rents	90	0	0
And there will remain a difference of	80	0	0

I know it will be urged, that I have eſtimated the crops of corn too high, not in price but in quantity; but in anſwer to this I ſay, that land cultivated, after my method, will be richer in quality than what is managed in the ordinary way, for a conſiderable quantity of this fodder, will, and muſt of courſe, be ſpent on the farm; this will produce a large quantity of dung, ſo that the farmer will never want manure wherewith to dreſs his land, and his crops, both of corn and clover, will be in proportion encreaſed.

My method may, on account of the frequent plowings, be ſomewhat more expenſive than the old negligent way; but when we conſider the profits, it muſt ſurely be allowed, that after all deductions that can be with reaſon made, there will ſtill remain a large balance in my favour.

When I ſay my method may be more expenſive than the old way, I mean as far as relates to the land that is immediately under the plow, which will every year amount in quantity to about thirty acres, or three portions; yet ſuppoſe (which is indeed an unreaſonable ſuppoſition) that the tillage of this quantity ſhould, in the method I recommend, coſt double what the ſame number of acres would in the ordinary way, yet would not my expence in tillage, taking the whole farm together, exceed that incurred in the laſt mentioned method; becauſe, it muſt be obſerved, that in the old huſbandry, the whole ſixty acres are annually plowed, whereas, in mine, only half the number of acres are in immediate tillage.

The intelligent farmer will eaſily ſee and comprehend the manner in which I have ſtated this account; let him alter it according to the quality and produce of his own land, and he will ſtill find it greatly for his advantage to adopt, in all its parts, the plan of huſbandry which I, warranted by the many years experience I have had, ſo ſtrenuouſly recommend.

It cannot be urged that I have exaggerated in this account, as twenty buſhels of wheat on an acre cannot be eſteemed more than a middling crop on tollerable land, that has been well plowed and well dreſſed with good manure in a proper quantity; farmers have very often forty buſhels, and nothing is more common, near large towns, than from thirty-two to thirty-ſix buſhels of wheat per acre, throughout a large field, or perhaps a conſiderable farm.

As to the price, wheat has not been much lower (in England) for ſome years, higher it has been often.

A man muſt indeed be greatly prejudiced againſt innovations not to be tempted by this proſpect of ſo conſiderable an encreaſe of profit; and the more ſo as the experiment, as far as relates to clover, may, though with evident diſadvantages, be tried on ſo ſmall a quantity of land as ſix acres, and it is pretty plain, no loſs can poſſibly come to the farmer who ventures to quit the old beaten track.

Let us now take a view of the produce of this farm of ſixty acres when huſbanded after the manner recommended by me in full bearing with Saintfoin.

When Saintfoin is the more immediate object, the ſixty acres muſt be divided into twelve portions or parts, each containing five acres.

	l.	s.	d.
There will be two portions, or ten acres in wheat, which I will eſtimate at half what I allowed under the article clover, that is to ſay	45	0	0
Secondly, there will be one portion under a third crop, which we may fairly value at	20	0	0
There will thirdly be one other portion of five acres in oats, and as this crop is generally conſiderable, we ſhall value it very low if we aſſign for it only the ſame ſum as for the laſt article, namely	20	0	0
Fourthly, there will be eight portions, or forty acres, in full bearing, under ſaintfoin, if we eſtimate the crop of theſe forty acres at ſixty loads, it muſt be allowed a very moderate calculation, and if we aſſign the ſame value to this as we did to clover, the amount of the whole will be	60	0	0

Thus

	l.	s.	d.
Thus the ſum total of the produce of the farm, when cultivated in my way, and under ſaintfoin, will be, according to the above calculation	145	0	0

Though the ſum total is here leſs than it was under the head of clover, as above calculated, it is neceſſary to obſerve:

Firſt, that this crop is leſs ſubject to accidents than clover, therefore more to be depended on. Clover is greatly hurt by a dry ſummer, whilſt ſaintfoin, which alſo hays much the beſt, ſcarcely feels it.

Secondly, the crops of corn that follow ſaintfoin, though I have eſtimated them no higher, are, when all other circumſtances are alike, conſiderably larger than thoſe which follow clover.

Thirdly, when the farm cultivated after my manner is under ſaintfoin, there will be much more fodder, and of courſe more dung than can be uſed, therefore the farmer will have an opportunity of turning a much larger part of his crop into ready money, by ſending it to market, but if he has not a ready ſale at a proper price for his ſaintfoin, let him divide his land into ten portions only of ſix acres each, as he will then have more corn and leſs fodder, which will be in ſuch circumſtances moſt to his advantage.

Fourthly, when the land in ſaintfoin is divided into twelve portions, the expence of tillage is leſs by almoſt one half than in the caſe of clover, there being twenty inſtead of thirty arcres under the plough.

However, after all my experience in the matter, I cannot form any judgment on it relative to the comparative profits, except that I have nearly found them equal, and never prefer one to the other, but according to particuly circumſtances.

I have, indeed, on my eſtate, two ſeveral diviſions or apportionments, one for clover and the other for ſaintfoin, but my principal reaſon for it is, that I find clover more convenient for me to be given green to my cattle, and that it yields better crops in certain parts of my land than ſaintfoin would do.

I would now fain aſk, admitting the exactitude of my calculation, and the truth of the facts on which it is founded, facts univerſally known in all the neighbourhood where I live, I ſay I would fain aſk, whether I have not the greateſt reaſon in the world to blame my countrymen, who live under the mildeſt of governments, for not practiſing this method of huſbandry, particularly when they are morally ſure that no exciſeman will come to ſnatch from them the fruits of their induſtry.

Such a conſiderable increaſe in the actual produce of lands, is certainly well worth attention, it is improving eſtates, without adding to their extent, and is undoubtedly much better than purchaſing any addition to the badly cultivated land a perſon may be already poſſeſſed of.

I ſeem in imagination, to ſee this huſbandry univerſally adopted, and in the ſame perſpective, I ſeem to ſee the honeſt huſbandman raiſing a larger profit for the benefit of his family, at the expence of leſs labour, fatigue, and ſweat, I ſee him better fed, better clad, more healthy, robuſt, and perhaps leſs vicious. Thoſe half ſtarved lean cattle, with which the poor hind now half plows his land, and thereby half ruins himſelf, ſeem to vaniſh from my ſight, and in their ſtead, I ſee our ſtables and ox-ſtalls filled with large and noble cattle, in good condition; I ſee neat habitations diſperſed over the face of the country. The proprietor of land, the farmer, and the handycraftsman, all partake of the benefits reſulting from this encreaſed produce. The public revenues, as well as the rents of particulars, are better paid, the value of land riſes together with the rents; in a word, every part of the country feels the benefit of this improvement, agriculture and trade flouriſh, and all things are rendered by it in a condition far more proſperous.

Neither is this a picture formed merely by the ſtrength of imagination, and which can never be realized; I have given ſufficient proofs to the contrary, and if it ſhould be thought any ways neceſſary, in order entirely to convince my readers, to obviate the principal objections which may be formed to the plan of huſbandry I here ſo ſtrongly recommend, I ſhall very willingly do it in a seperate chapter, which ſhall conclude the preſent treatiſe.

CHAPTER VI.

The principal Objections, which may be formed to this Plan of Huſbandry, anſwered.

It is a diſorder incident to human nature, to diſdain being inſtructed by an equal. Scarcely indeed do we brook with it from our ſuperiors.

Farmers are not free from this diſorder, vanity and envy often cauſe them to neglect their true intereſts, rather than reap any benefit from the inſtructions and examples of their neighbours, as that would be acknowledging a ſuperiority in one reſpect at leaſt.

I muſt therefore naturally, and in courſe, expect that many people will reject this plan of huſbandry, without ever having ſufficiently examined it, or even comprehending the extent of its meaning.

Let ſuch do as they pleaſe, let them form objections, and caſt what difficulties they can in my way, it is but fighting with the air. It is no ways neceſſary for me to give myſelf uneaſineſs on this account, neither is it at all incumbent on me to ſuggeſt anſwers to ſuch objectors, before they have made their attack.

But other well meaning readers may ſtart at ſome objections, ſpecious at leaſt, which ſeem to offer themſelves, and may imagine that my whole plan is likely to be overſet by them; ſuch we muſt, if it is poſſible, ſatisfy.

It may be objected, that if ſo large a proportion of our land was converted to cultivating graſſes, bread corn would become ſcarcer, and of courſe dearer, an objector might probably ſay to me, "You propoſe here a plan of improvement, which appears to be very advantageous to the farmer, but would it be equally ſo to the other claſſes of the people? What a conſiderable quantity of land would in your method be taken from the plow? Of courſe, if your plan is fully carried into execution, it muſt neceſſarily enhance the price of bread corn, that principal requiſite, that abſolute neceſſary of life, or it might by leſſening the quantity of corn raiſed, occaſion our wanting a ſupply from abroad, and then our neighbours might either ſupply us at their own price, or refuſe to do it, which ever they thought proper."

This is the ſtrongeſt and moſt ſpecious objection that can be formed to my plan, yet may it with the greateſt eaſe be anſwered.

In anſwer to it, I muſt in the firſt place obſerve, that the farmers and huſbandmen are certainly the principal ſtrength of the ſtate, and of courſe this claſs of people ought to be at leaſt as much encouraged as others, if not more. Why ſhould theſe men labour hard for a ſmall profit, when handycraftſmen who are never expoſed to the injuries of the weather, and whoſe work is done with much leſs waſte of ſtrength, are by far better paid?

Secondly, every farmer has certainly a right to follow that mode of culture which is moſt advantageous to him; when corn ſells well, you may depend upon it he will endeavour to grow as much of it as he can.

Thirdly, as this plan of culture will of courſe encreaſe the number of our black cattle, butcher's meat will be in much greater plenty, and cheaper, and this cannot but influence the price of bread; we may then without murmuring, allow for a large exportation of wheat, as when butcher's meat is brought in greater plenty to the market, bread will not be the only food of the poor, and will alſo be conſiderably cheaper.

Fourthly, to give a ſtill more ſatisfactory and immediate anſwer to this objection, I deny that there will be leſs wheat grown when this plan of culture is properly carried into execution: on the contrary, I aver there will be more.

When clover is the object of this culture, a third part of the land will be under winter corn, which is the ſame quantity as in the old huſbandry; the other portions will ſupply you with a conſiderable quantity of manure, to dreſs theſe two portions; to this we may add, the meadow land on the farm, which I have not included in my plan, and the quantity of manure you will poſſeſs, will be almoſt doubled: if you plow in an unhuſband-like manner, I acknowledge that this encreaſe of manure, will only be a means of your having a larger quantity of ſtraw, but if you plow deep, and keep your land in good tilth, you may ſave a great deal of ſeed, and not only have more ſtraw, but double the quantity of corn. Thus laſt year I had four quarters of wheat an acre, whilſt my neighbours had ſcarcely four comb an acre of wheat, much inferior to mine in quality.

Fifthly, when ſaintfoin is cultivated according to my plan, only half the quantity of land now ſown with corn, will be under wheat, (if the land is divided into ten portions two thirds) but if theſe two thirds, or this half, will produce as much corn, the ſaving in ſeed will be all clear profit; the ſame may be ſaid of ſpring corn.

Sixthly, as we ſhall have more dung, all thoſe lands which now lay waſte, may be brought into tillage.

Seventhly, we need ſay nothing more in recommendation of this plan, than that corn is cheapeſt and in the greateſt plenty, in all thoſe counties of England which have adopted the culture of clover and ſaintfoin.

It cannot then but be acknowledged, that the apprehenſion of corn becoming ſcarcer or dearer by the adoption of this plan of culture, is indeed very badly founded.

Let us next examine whether the obſtacles which this plan may meet with when it comes to be carried into execution, may not with as much eaſe be removed.

I know it will be objected, that the expence of encloſing, will be too great to be born by common farmers; it will doubtleſs be ſaid, that "the practice of this method of culture cannot be generally adopted. What an expence muſt it be to encloſe the ſixty acres above-mentioned, or any other quantity of land to be brought under this courſe of tillage, the procuring an act of ſtate, digging ditches, planting quickſet hedges, keeping up the fences, all this muſt require at leaſt a double capital, which few private people can afford to advance."

To all this I anſwer, that whoever ventures to make theſe diſburſements, will find himſelf in the end amply repaid by the many advantages which will accrue to him. Were the expence much greater than they really are, they would ſtill bear no proportion to the benefits reſulting from the practice of my plan. As to the procuring an act of ſtate, I acknowledge that to be attended with ſome difficulty, as well as expence, but I hope it will not be long before this obſtacle is entirely removed, and that a general act of encloſure may be paſſed, impowering every land owner to appropriate to his own immediate and particular uſe, the land which now lays in common, by encloſing it, provided it is with quick hedges, and that oak trees are planted for timber, at certain diſtances. This will not only ſupply the decay of timber, which has ſo long with great reaſon been complained of, but will alſo be a ſhelter to the corn from blighting winds, and will make our crops much more certain and regular, than they now are.

Great objections have been formed againſt the encloſing of common lands, and plowing up ſheep walks; it has been even ſaid, that if ſuch a plan of huſbandry was purſued, our breed of ſheep would by degrees dwindle and be loſt, our annual ſtock of wool greatly decreaſe, and that valuable branch of trade, the woollen manufactory, be transferred to ſome other nation. But the caſe has turned out quite contrary, for though in England ſo much more land has been brought into tillage, than was before under the plow, yet wool is ſo plentiful, that many hundred tons are annually ſmuggled into France, without raiſing the price of it in any conſiderable degree. The reaſon is plain; when the ſame quantity of land produces larger crops, as it does undoubtedly by my method, it muſt neceſſarily be capable of ſupporting a greater number of ſtock.

For theſe reaſons, I hope, that not only an act may paſs to permit every one to encloſe his own land, as I have already obſerved, but I alſo hope it will contain a clauſe to compel every one to do it within a limited time, for the benefit of the community in general; I am ſenſible many will exclaim againſt this doctrince, alledging that it is not conſiſtent with the liberty we enjoy, but this is ſaying nothing, to indulge our own humours, when it is hurtful to the nation, cannot be called liberty, and there ſurely can be no great harm in obliging a man to do himſelf a ſervice, eſpecially when it happens as in this caſe, it does to coincide with the public good.

But another objector ſtill continuing the argument, will perhaps ſay, "You cannot certainly mean that all the ſmall plots, acre and half acre lands, ſhould be encloſed, ſuch as are ſeen diſperſed over all the common field land, your intention, doubtleſs, muſt be that they alone ſhould have the liberty of encloſing, who poſſeſs pieces of a tolerable ſize, as five or ſix acres and upwards, of courſe what a number of exchanges muſt there be, and what confuſion and diſputes will ariſe, beſides the expence of writings to be drawn, wherever any exchanges of land are made."

I acknowledge the truth of this, excepting that I would have encloſing general, but it muſt at the ſame time be admitted, that as much the greateſt part of our land owners are proprietors of conſiderable tracks of the common field uninincloſed land, exchanges might eaſily be made, and at no great expence, or as in many caſes is uſual, the whole of the land might be allotted, and a jury of impartial and diſintereſted men might aſſign every one his proper portion. This might eaſily be done, and it is well known that when land is thus encloſed, the rent is immediately doubled, and it becomes of three times the value to ſell. In ſome counties where the gavel kind takes place, theſe encloſed pieces might, it is true, again be divided, but marriages or inheritage might alſo again unite them; pieces might alſo be procured by purchaſe, and when it was once known that to cultivate land to advantage, the fields muſt be of a moderate ſize, this would in ſome ſort prevent theſe ſubdiviſions.

The beſt cultivated lands are let at the higheſt rents, and improved eſtates are alſo doubtleſs of the greateſt value, this then ſhould induce the proprietors of land to have ſome attention to their own intereſt, which cannot be more effectually promoted than by the adoption of the plan of huſbandry, which in this treatiſe I have ſo ſtrenuouſly recommended.

I have now, I think, anſwered the principal difficulties which can be objected to my plan; theſe have all been mentioned to me by different people whom I have conſulted on the ſubject, as to other more inſignificant objections which either do not occur to me, or which merit not my attention, I leave them to ſuch as may have more leiſure to conſider them, and that I may not loſe that merit which conſiſts in brevity, I ſhall in this place bid adieu to the candid reader.

ARTICLE XLI.

An Account of the Method in which the eſtate of Aſpi near Aarberg in Switzerland, was improved, written by Mr. TSCHIFFELI.

ALL huſbandmen know the truth of this maxim, that a great plenty of fodder is the mother of agriculture. It is requiſite there ſhould be a certain quantity of graſs land to every farm. It will then ſeem ſurprizing that a peaſant far from being rich, ſhould be able to cultivate to advantage, a parcel of land that was all in tillage, yet experience tells us this has been done. This example we think proper to be laid before other farmers, that they may be induced to follow it.

In the year 1743, their excellencies thought proper to ſell the greateſt part of the land that was dependant on the caſtle of Aarberg; the eſtate of Aſpi amongſt others, was ſold. It conſiſted of about ſixty acres in tillage, divided into three portions, a very indifferent barn, and a right of commonage on a large marſhy tract. Such as knew the eſtate well, knew how ſmall the crops on it were.

Every one therefore was aſtoniſhed that Nicolas Walti, father to the preſent proprietors, who was but in very indifferent circumſtances, ſhould buy this eſtate at ſo large a price as 15,000 livres of Berne; they imagined he and his whole family, would in a few years be ruined, and the ſooner as there was no ſpring of water on the eſtate, nor any means of watering it.

Walti had two principal reaſons for buying this eſtate. He at that time held a farm about two leagues from Aſpi, and he hoped he ſhould be able to cultivate both farms with the ſame ſtock, ploughs, horſes, &c.

He was alſo in hopes that the ſoil of Aſpi would be proper for laying down in graſs, which, however, he did not in the end find to be the caſe.

He at that time knew nothing of the ſoil called in Switzerland, *Ey-Grund*, of which the ſurface of the eſtate of Aſpi entirely conſiſted. This is a bad kind of a clay.

He thought from the appearance of the land, that after it had been ſuffered to reſt a little, it would produce good paſture.

The truth is, that they who are not thoroughly well acquainted with this mild and light brown earth, which when once it is broke up, is with great difficulty brought to bear a turf again, may eaſily be deceived by it.

In order to be perfectly well acquainted with it, it is neceſſary to obſerve, that in rainy weather it becomes very clammy, and in dry weather it is very apt to cleave, inſomuch that there will be deep cracks in it.

Of this ſoil, the whole ſurface of the eſtate of Aſpi conſiſts; under it, at various depths, from ſix inches to three feet, is a kind of earth, originally white and wet, but much mixed with ſand, and, according to all appearance, entirely barren.

Walti ſoon found, that if he did not take ſome new meaſures with his late purchaſed land, he would be ſpeedily and infallibly ruined.

The land at Aſpi produced only a very ſcanty feed for his cattle, and he found, when too late, that his farm was at too great a diſtance for him to cultivate both with the ſame horſes, unleſs he put himſelf to great inconveniences, and incurred very large expences. He came therefore to a reſolution of quitting his farm, and of uſing his own and his ſons beſt endeavours to bring the land of Aſpi into good condition, and to try whether ſaintfoin, now well known in all parts, but at that time very little cultivated in Switzerland, except in the country of Vaud, and the diſtrict of Neufchatel, would ſucceed on his land.

He made his firſt experiment in 1747 with about half a buſhel of the ſeed, and to this ſmall trial are we to attribute the preſent flouriſhing condition of the eſtate of Aſpi, and the eaſe and affluence of its proprietors. Theſe laſt now pay five times as much tythe as did their late father. They grow every year a very conſiderable quantity of winter grain, and have ſaintfoin hay enough to winter from twenty to twenty-five colts, buds, or oxen, to ſay nothing of their ſpring corn, and a great quantity of green fodder that is conſumed in the ſpring, ſummer, and autumn, by their ſtock. In fact, theſe two brothers, the Walti, by the bleſſing of God, and their induſtry, are the richeſt people in the neighbourhood, and their wealth is every year encreaſing.

As we have remarked that the preſent flouriſhing condition of the eſtate of Aſpi, and the wealth of its owners, is wholly to be attributed to their cultivating ſaintfoin, and as every farmer who holds encloſed land that is not either too ſtrong nor too wet, may follow their example; it cannot fail being beneficial to all huſbandmen, if we relate in a plain intellegible manner, the method in which the two brothers Walti managed in order to crop their lands with this uſeful graſs.

After having plowed and manured a piece of land for ſowing on it Bere or ſquare Barley, they plow it immediately after the Bere is harveſted, and then harrow it and croſs harrow it with a pair of very heavy wooden drags; they then ſow on it ſaintfoin after the rate of nine buſhels to an acre, and again harrow and croſs harrow the land.

They then leave the land after it has been thus ſown in the month of Auguſt till the following ſpring, without troubling themſelves whether the weeds come up with the ſaitfoin or not.

They know by experience that their land is not well adapted to the growth of natural graſs, and that the ſaintfoin will choak up all the weeds the ſecond year.

They mow this ſaintfoin for the firſt time about Midſummer following, and it will afterwards grow ſtrong enough to afford good feed for young cattle; I ſay young cattle, becauſe the land not being ſufficiently ſettled the firſt year, the owners take care not to turn on it full grown cattle, as they would by their weight poach the land, and do great damage to the ſaintfoin: at the end of two years, however, the land being better ſettled, they drive on their great cattle, and have not found any damage to enſue to the ſaintfoin, provided they take care only to turn them on in dry weather, and do not ſuffer it to be eaten down too cloſe.

When the ſaintfoin is mown, they leave it in the field to dry as much as poſſible, particularly that which they intend for the uſe of their horſes, and when they get it in, they follow the ordinary method practiſed with common hay, excepting that they never cock it, loading it from the ſwarth. By this means they loſe fewer leaves, and leſs of it is ſcattered.

If any rain falls on the ſaintfoin, ſo as to wet it whilſt the hay is making, they leave it in the field, without ſtirring, till it is thoroughly dry, for if they were to cock it like common hay, it would heat, turn black, and be of no uſe.

The owners of the eſtate of Aſpi, have, at this time, ſuch plenty of ſaintfoin, that they not only every year ſave a ſufficient quantity of ſeed for their own uſe, but in favourable ſeaſons have a great deal to ſpare to ſell to their neighbours, for which they get a good price.

When they mean to ſave the ſeed of ſaintfoin, they leave it ſtanding till the ſeed is perfectly ripe; but that which they intend for the uſe of cattle, they cut when the plant is in bloſſom.

That the ſeed may have the more time to attain its perfect maturity, they ſave it from the firſt cutting, and never from the ſecond. It is cut when rye harveſt begins in the following manner.

They mow ſaintfoin, when it has ſtood for ſeed, nearly in the ſame manner as in ſome countries they mow wheat, that is to ſay with a common ſcythe, but then they take only half ſtrokes, and are particularly careful that the crop end of the ſaintfoin ſhould always fall on the tail of that cut before: they then leave in the field, till noon, the ſaintfoin that was cut at the break of day. At noon they make uſe of forks to lay the ſaintfoin in ſwarth, beginning where they left off mowing, in the ſame manner as is done with the hands in wheat harveſt when the crop is mown.

If the day is very hot, the ſaintfoin is left to dry from noon to night, at which time they, with great care, get it into heaps. They then load it with a fork into a waggon lined with a coarſe cloth, taking care that the crop ends are inward.

If the day has not been hot enough, the ſaintfoin is very carefully turned with ſmall poles, and it is not carted in till the next day after the dew is off the land.

In order to execute this work properly, it will be neceſſary to have careful people, or a great part of the ſeed will drop on the land.

When the ſaintfoin is got into the barn, it is ſpread very thick on the floor, when one or two threſhers paſs the flail lightly over it, turn it, and threſh it once more.

When the ſeed is threſhed out, the hay or ſtraw that is left is rather of the coarſeſt; however, horſes which have no great matter of work to do will eat it in the winter, but it muſt not be given to horned cattle, as it would ſet their teeth an edge, and ſpoil them.

When the ſeed is threſhed out, it ſhould be ſpread very thin on an airy floor for three weeks or a month, ſtirring it at leaſt once a day with a rake, or it will be apt to heat, and then it will not grow. It may at the end of that time be laid in a round heap about eighteen inches high, obſerving, however, to ſtir it every day for ſome time with a ſhovel.

The two brothers Walti have obſerved, after a long experience, that ſaintfoin will preſerve its vigour and growth in their land from ten to fifteen years, without dung, or any other amendment. The deeper their clay is, the better does the ſaintfoin thrive. The greateſt vigour of the plant is with them from the third to the eighth year. They have annually two large crops, but the firſt is always moſt conſiderable; however, it is only where the clay is deep that they have two crops annually, for where it is ſhallow they are content with feeding it after the firſt crop is off, and the plant begins to ſhoot again.

Green ſaintfoin is excellent fodder, and makes cows give a large quantity of milk; as to the ſaintfoin that is dried for hay, the proprietors of Aſpi have obſerved that the ſecond crop is better for cows than the firſt, and the ſame is to be ſaid of common hay.

If the bere ſown on the land intended for ſaintfoin happens to be thin in ſpring, they do not wait till harveſt before they ſow their ſaintfoin, but ſow it amongſt the bere about the time that rye begins to ſpindle, harrowing in the ſeed with a light wooden harrow.

One advantage they derive from this practice, which is, that they can turn young cattle in to graze it the firſt year.

They have alſo another method of ſowing ſaintfoin.

They plow before the winter, very ſlightly however, ſome land that has been under wheat, ſcarcely doing any thing more than turning up the ſtubble. In the ſpring they harrow up the ſtubble, and plow the land in the ordinary method.

As ſoon as a mild rain comes on, they harrow the field, and ſow it with ſpring barley, and immediately afterwards with ſaintfoin, plowing them both in with a light furrow.

Laſtly, they ſometimes ſow ſaintfoin in the ſpring alone as ſoon as the hard froſts are over, and they have hitherto found no difference betwixt theſe two laſt methods.

They have plowed up ſeveral fields where the ſaintfoin began to fall off, and after two or three plowings, they have ſown them with winter corn. They find by experience, that the corn is finer in theſe fields than in thoſe which had never been ſown with ſaintfoin, which is an evident proof, that this plant rather improves than impoveriſhes land.

I received this account from Nicolas Walti, one of the proprietors of the eſtate of Aſpi.

The amazing improvements of theſe lands is well known to all the inhabitants of the Bailiwick of Aarberg, and this remarkable example of ſucceſs, has greatly contributed to the eſtabliſhment of ſaintfoin in all that part of the country.

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ARTICLE XLII.

An Eſſay on the means of preventing the Smut in Corn, written by Mr. B. HERCULES SPRUNGLI *of Lipperſwyl, in Thourgovia, Switzerland.*

IN an Eſſay on the ſmut in corn, inſerted in the *Nouvelles Œconomiques*, publiſhed in Germany, the author recommends a remedy againſt this diſtemper. It conſiſts of a mixture of rain water, quick lime, ſoot, and common ſalt.

In the 1754 a third part of my wheat was ſmutty. The Lixivium, abovementioned, preſerved me from it the following year, the ſhort backward ears only being infected.

If I miſtake not, Richard and Leopold adviſe farmers to ſow only wheat of more than one year old.

In my experiments, I united theſe two precautions.

My experiments, which have been continued only a few years, are not of ſufficient authority to decide in this matter. The authors abovementioned, attribute the ſmut in corn to the want of ripeneſs in the ſeed.

I endeavoured to benefit by their advice. For four years paſt our oats have ripened very unequally; we have, beſides, within that time, had a fourth, a third, and ſometimes even three-fourths of our oats ſmutty. Spring barley, which is apt to ripen very unequally in our part of the world, is alſo frequently ſmutty.

Can this lixivium ſupply the want of ripeneſs, by giving the ſeed a greater vegetative power, or do the unripe ſeeds become totally ſterile after they have been kept a few years?

I have endeavoured of late years to ſteep oats and barley in the lixivium, but it had not quite the wiſhed for effect; however, I ſuffered then leſs from the ſmut than my neighbours.

As my ſeed was thoroughly ripe, perhaps the lixivium was too weak, and could not penetrate the tough outward ſkin, or, perhaps, I did not leave the ſeed long enough ſteeping in the lixivium. But theſe omiſſions may eaſily be remedied by others, who may adopt this method of preſerving their crops from ſmut.

ARTICLE XLIII.

Account of a Lixivium, which the Farmers of the Country of Nidau, in Switzerland, make uſe of, to prevent their Corn from being ſmutty; written by Mr. N. E. Tscharner, *Secretary to the Œconomical Society of Berne.*

IN the country of Nidau, where they grow a great deal of good corn, Bere or ſquare Barley in particular, is very much ſubject to be ſmutty.

A farmer of Moeſiguen boaſted he had a ſecret of preſerving corn from that diſtemper, and, in fact, his aſſertion was proved to be true, by his crops being more free from it than thoſe of his neighbours.

He made uſe of a lixivium to waſh and prepare his ſeed before it was ſown.

Not having time to aſſiſt all thoſe who applied to him, he came to a reſolution of ſelling the receipt to his neighbours, one of whom was diſintereſted enough to make it public.

The more this method of preparing the ſeed corn was known and tried, the more credit it acquired, and at this time no farmer in that neighbourhood is lazy enough to grudge the trouble of preparing his ſeed in this manner, or covetous enough to heſitate at the expence of the operation.

A wealthy and intelligent farmer communicated the receipt to me, aſſuring me at the ſame time, that for ten years paſſed, which he has uſed it, his corn has been entirely free from the ſmut, without even excepting laſt year, when the ſmut made ſuch havock amongſt the wheat and bere.

To twenty gallons of water put about half a buſhel of quick lime, half a pound of ſoap, and the ſame quantity of ſaltpetre. Theſe two laſt ingredients may be ſaved, if the draining of the farmer's yard is uſed inſtead of plain water. Theſe twenty gallons of water ſhould be boiled till the lime is entirely diſſolved in it.

The farmer begins to prepare his ſeed when the lixivium is almoſt cold. He firſt puts half a buſhel of ſeed into a tub, on which he ſprinkles with his hand to the qunantity of two quarts of the mixture, keeping the corn ſtirring all the time with a ſtick.

He then throws in another half buſhel, which he in like manner ſprinkles with the mixture, ſtirring at the ſame time the whole maſs well. He continues this work till the tub is near full, uſing about two quarts of the lixivium to half a buſhel of corn.

He then covers the tub with a coarſe cloth, and leaves it for eight and forty hours to dry, only he muſt ſtir the corn twice in that time to forward the evaporation of the ſuperfluous moiſture, and to ſpread the duſt of the lime in all parts alike.

It is to be remarked, that in this operation the corn encreaſes in bulk one ſixth part, of courſe, where five buſhels of unprepared ſeed would be ſown, ſix muſt be uſed.

The farmer, who furniſhed me with this account, ſays, that he always prefers uſing this lixivium milk warm, and that of all drainings of yards, he likes that beſt which comes from horſes and hogs, which may occaſionally be mixed with the muddy water of bogs or ponds.

ARTICLE XLIV.

A Deſcription of the Hay Harveſt in the Environs of Bourgeſtein in Switzerland. Written by Mr. DE G. DE B . . . . *Member of the Berne Society.*

WHILST others are employed this fine weather in getting in their hay, which is now arrived at its moſt perfect ſtate, I ſhall fill up a little leiſure time in deſcribing the travels of the honeſt huſbandman, when employed in his hay harveſt, and getting together a ſufficient quantity of fodder to ſerve his cattle during the long winter months.

Before the ſun has gilded the ſummits of the high mountains, the careful huſbandman awaking ſteals from the arms of his beloved wife; he takes his ſcythe, calls to him the companions of his labour, and betakes himſelf to the meadows, yet covered with dew. The moiſtened graſs falls beneath his feet at every ſtep he takes, not a flower is ſpared, and the earth is ſcarcely permitted to reſerve to itſelf the roots.

The creeping plants, the ſlender but tall ſtalks, the trefoil already ripe, and the cummin which ſerves inſtead of ſpice to the farmer, are cut down and ſpeedily dried. He contemplates this image of the uncertainty of human life, yet ſtill advances with equal ſtep. In this manner a true philoſopher conſiders with a tranquil eye the common incidents of life.

When the workmen have mown a conſiderable part of the meadow, the miſtreſs brings them a repaſt, which ſhe has with her own hands prepared. Sometimes it conſiſts of milk pottage, at others of boiled pulſe, on which alone they make a hearty meal.

They ſit down on the graſs, and chearfully enjoy theſe ſimple viands. The moſt delicious banquet does not ſo well ſatisfy him who has vitiated his taſte, as this frugal repaſt ſeaſoned and made ſavoury by labour.

The maſter takes no great reſpite, he whets his ſcythe, and again goes on with his work. His companions follow him in the ſame line, raiſe their ſcythes, and the graſs once more falls beneath the blade. The beſt diſciplined troops, which uſe their arms for the deſtruction of their fellow creatures, obſerve not more order, or follow their commander with greater obedience.

The women, one being allowed to two mowers, ſpread the ſwarths with forks. As ſoon as the ſun has diſperſed the dew, they ſcatter on the turf the half made hay, which had the day before been got into cocks, in order to preſerve it during the night from being injured by rains or dew. The young children, playing about their mothers, accuſtom themſelves betimes to lend her ſome aſſiſtance; but being ſpeedily tired, they lay down on the ground which they are one day to cultivate, and in this manner inure their tender limbs to bear the ſun's heat.

Towards noon, every one having mown his acre, carries home his ſcythe and ſharpens it againſt the next morning, though ſometimes this work is delayed till evening.

The maſter frequently watches the clouds, that he may thereby judge of the weather. He then calls his companions, and each man taking a rake, they haſten to turn the hay, which they had the day before mown, after which they turn that which was growing in the morning.

When this is done, they range themſelves in couples, and working back to back, gather the hay in rows, and afterwards make it into ſmall cocks. Two men do this with forks, whilſt the women carefully

fully rake up the hay which the men had left. In the mean time, the maſter arrives with his waggon, drawn by ſtout horſes. Obſerve him carefully, and you will ſee him with the ſtrength of a Sampſon, take up with his fork entire cocks, and hand them to the man who artfully loads the waggon. It is now raiſed above the fore ladder of the carriage, when giving him a ſtrong pole or lever, he binds the hay tight with a thick rope.

This load, high and unſteady, is accompanied by two ſtout men, who ſupport it in rugged ways.

In the flat meadows, they draw the waggons into the barn, and unload the hay where it is to lie, ſpreading it equally, and treading it down, that it may the better preſerve its fine ſmell. In this manner are the enamelled meadows deſpoiled of their beauty.

In the ſloping mountain paſtures, they make uſe of ſledges, on which they carry every cock towards the barn; this work requires as much care and induſtry, as the ant employs to ſecure his little provinder.

The wiſe huſbandman takes care to build his barn at the foot of the hill, ſo that he can bring the ſledge quite into it, and unload it in a ſhort ſpace of time.

There alſo for the ſaving of time, art has invented another method. As the meadows have in ſome places too much ſlope, to admit of the uſe of a waggon, a ſingle horſe draws his load on a ſledge, and haſtes to get rid of it.

A ſtranger travelling that way, would be ſurprized at hearing a noiſe like thunder. He looks around him and perceives no ſign of a tempeſt. His curioſity prompts him to approach the barn whence the noiſe proceeds, the floor is laid on the ground, and yet he ſees the hay fly with great quickneſs through the air. Uncertain whether he can believe his eyeſight,

ſight, he obſerves the operation with great attention. He perceives a cord faſt tied to a pully, without knowing for what uſe it is intended.

Soon after, another ſledge with a like load arrives. He then ſees that they empty it into a kind of net, and that the hay is drawn up from the ſledge. Under the roof, ſtands a man like a centinel, he receives the load, and throws it to the place where it is to remain. Scarcely had he got hold of it, but he gives a ſignal by a cry, to the man who ſtrongly held one end of the rope by the ſledge upon which he is ſeated, and from which he had drawn up the load; this laſt lets go the rope, and nimbly jumps out of the ſledge.

The empty net is again let down, and is ready to be once more filled. The beholder can ſcarcely believe his eyes, and ponders in what manner he can beſt imitate an art which appears to be ſo uſeful.

Let us next caſt our eyes on that marſhy plain where man is obliged himſelf to do the work for which he keeps his cattle. Neither the horſe for which this fodder is got in, nor any aſſiſtance of art can eaſe the huſbandman of this labour.

Several workmen form themſelves in a row, and in couples carry a truſs of hay on two poles, which would ſooner break than ſlip from the hands of the robuſt bearers. When they have got halfway, they meet with another couple who eaſe them of their load, and carry it to a low barn. They know that men are under an obligation to aſſiſt their brethren in their common labours. Happy villagers! What advantage would it be to the more poliſhed inhabitants of the world, were they to practiſe this duty, which they too frequently neglect. You alone faithfully bring into practice this admirable precept, with the excellence of which you are ſo well acquainted.

The hay is then left in the low barn, till the ice and ſnow have made the ground hard enough to bear the horſes, ſo that they may bring it into the loft. The provident huſbandman is not yet tired, but gets home his hay at a ſeaſon when the inhabitants of the towns dare ſcarcely ſtir out of their houſes.

The hay of low marſhy meadows, is generally given to horſes. It is got in when the weather is fine, and the ſame day it is mown, for it dries much faſter than that of dry meadows. Rain alſo ſpoils it much ſooner than the fine upland hay, which is given to the cows.

This laſt, may in like manner, be got in the ſame day it is cut, provided it happens to be quite dry, and that much of it is not laid together, but it will ſoon ſpoil in the barn if it is not very dry.

More care ſtill muſt be taken of the Rowen hay, which ſcarcely ever dries the ſame day, let the weather be ever ſo hot. That which dries faſteſt, and is ſooneſt got in, is generally reckoned the beſt.

The author of the Maiſon Ruſtique, ſays that in England they aſſert, it is better to let the cut graſs lay ſeveral days without ſpreading, and that then it ſhould be dried in order to its being carted. Our method however, appears to me to be much the beſt, becauſe graſs preſerves its ſmell and taſte more when it is ſpeedily dried. I have remarked, that the hay which has for ſeveral days laid on the land has ſcarcely had any ſmell, whilſt that which has been quickly got in, has had a moſt delicious odour.

The naked eye can ſcarcely diſtinguiſh the ſolitary labourer who is walking on thoſe heights, and who, without aſſiſtance, lays down his load on a large cloth. The ſlope of the mountain which will ſoon incommode him, now aſſiſts him in taking up his burthen; he continues his way in a ſtooping poſture, but his firm foot carries him ſafely over the rugged hill. He fearleſs advances through ſteep paths towards his cabbin, which is more diſtant from the valley, than from the clouds. But he is at the ſame time as much out of the reach of thoſe numberleſs paſſions which agitate men here below, as his cabbin is placed above their habitations.

When he beholds the herd of cattle that is to ſupport him during the winter, he flatters himſelf with the pleaſing hope that he ſhall have wherewithall to ſubſiſt, when the mountains covered with ſnow will have cut off from him all communication with his fellow creatures.

May you long enjoy the fruits of your labours with a contented mind! you will be ſtrong and hearty at an age when the citizen debilitated by too much eaſe, will regrettingly have left his long loved treaſure to his griping heirs!

It frequently happens, that a ſingle man will paſs the winter in theſe mountains, with ſome cows, in a little cabbin, which cannot be approached for ſeveral months together, on account of the quantity of ſnow.

On that ſteep hill, uninhabited and ſurrounded on all ſides with rocks, where no carriage can paſs, the precipice is under a neceſſity of contributing to get in the crop.

The hay is put into long, but narrow nets; the bold mountaineer drags it to the edge of the rock, and rolls it down. He then cautiouſly deſcends after it, and carts his booty into his ſlender hut.

But let us now quit this dangerous diſtrict, and turn our eyes once more towards thoſe rich meadows.

After the graſs is cut, it is gathered into rows, and ſuppoſing it to be not yet ſufficiently hayed, if there is time to do it, and it is likely to rain, they make it into cocks of various ſizes. The rows would receive leſs damage from a haſty rain, and the cocks from one that continues any time. If the graſs is quite green, it may be left in the ſwarth.

When this work is done, the maſter returns home, telling his ſon, who accompanies him, what he is to do.

To-morrow, ſays he, you are to get into the loft the drieſt part of the hay, that which we cut to-day is not yet in proper order. On that ſide you are to put that which may be a little moiſt, for the hay we got in there to day is almoſt dried to powder. The heap will thereby acquire a brown hue, the cows will eat leſs of it, but they will give more milk.

Here, adds he, we will put the aftermath hay on the firſt crop, it will heat leſs, and make the hay taſte better. Below we will put the coarſeſt of our hay, for this muſt be eat by our cows before it grows hard.

Above all things, continues he, my ſon take care not to put any iron amongſt the hay, and ſtill leſs amongſt the rowen hay, as it might take fire and do much damage. You ſhould not tread on the hay when it comes to a certain height.

The young man liſtens with attention and pleaſure to his father's inſtructions, and is preparing to aſk him ſome farther queſtions, when his mother, who has been buſied in houſhold affairs, calls them to ſupper; the night reminds them that they have need of repoſe, the day, rather than their ſtrength, being on the decline.

Happy couple! their conſciences reproach them with no ſin, they are thankful to him who gave and preſerves to them healthy and robuſt bodies; ſleep now cloſes their eyelids, and they ſpeak only to wiſh each other a good repoſe.

Live happily! redouble your efforts, and be to-morrow, as you have been to-day, employed in the works that are ſuited to your ſtation of life.

May the fruits of folly and corroding care be for ever kept at a diſtance from them ! May theſe happy children of nature enjoy continual eaſe ! Innocence and induſtry are the bulwarks of virtue, and the ſureſt means of rendering a man happy.

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ARTICLE XLV.

An Eſſay on the Culture of Vines, written by GABRIEL ANET, *Vigneron (Vine-dreſſer) at Chailly in Switzerland.*

THERE is no doubt but that the cultivation of lands, of what nature ſoever they may be, ſhould vary according to the difference of climate, ſoil, and aſpect.

The vines of the country of Vaux for inſtance, have been kept up time immemorial from cuttings, whilſt thoſe of our Bailiwick of Vevay cannot be long kept up by that means. We are under a neceſſity of taking them up when they are old, becauſe the cuttings do not ſucceed.

I ſhall not attempt to find out the phyſical cauſes of this difference. The diligent planter ſhould confine himſelf to labour, guided by experience.

My preſent deſign is to relate ſome diſcoveries I have, with this view, made, reſpecting the manner of cultivating vines in this part of the world.

Of the Mixture of Earths.

I ſhall, in the firſt place, treat of the mixture of earths. In taking up vines, the labourers always take care to remove the points of rocks, which may incommode them in their annual tillage of the plants, and in places where the ſoil is deep, they dig holes and bury the ſtones, which holes ſupply them with good earth to cover the rocks where they are bare; yet hitherto they have not known how to make the beſt advantage of certain veins of earth, which they find diſperſed here and there in taking up the vines; they know not what profit reſults from digging up this earth, and mixing it with that of the ſurface.

This mixture has a ſurpriſing effect. Before I ever heard talk of marl, in taking up a vine, I found a vein of very compact white earth, which ſeemed to be very ſoft to the touch. I made not the leaſt doubt but that this earth, of which I had no experience, might to great advantage be mixed with that of the ſurface; I tried it in ſeveral places where vines were growing, both young and old, and it gave to the old vines ſuch vigour, that they ſeemed as it were to be grown young again, and bore plentifully, without the aſſiſtance of any other manure.

I can ſay the ſame of a kind of looſe crumbly rock. in ſome places this runs pretty deep, but when it is expoſed to the air it crumbles like lime or aſhes. It does very well alſo when it is mixed with ſtrong land, and if laid on in any quantity, it yields a wine of an excellent quality. Let us hope that the Vignerons will, for the future, be more attentive to a mixture of earth, as I am certain great advantages may be derived from it.

Method of taking up Vines.

As to what relates to the method of taking up Vines, it is pretty well known in our quarter of the world. Where there is a ſufficiency of ſoil, the digging on this occaſion cannot be too deep. This work ſhould be done in autumn, and not in rainy weather, nothing is worſe than omitting this precaution, particularly in ſtrong lands.

My opinion is, that the ſpring following ſome barley, or other ſummer grain, ſhould be ſown; but in reaping it, at leaſt half a foot of the ſtubble ſhould be left behind on the land, and immediately after harveſt the land ſhould be again dug very deep, and the ſtubble be thereby covered. It enriches, ſwells, and pulveriſes the earth, which having been looſened by the winter froſts, the layers or rooted plants, that are put into it, ſucceed ſurpriſingly well.

I would by no means have any one plant their layers when the corn is ſown, as ſome recommend, it is the worſt thing that can be done. They think to gain a year by it, but on the contrary it occaſions a great loſs of time. This truth is confirmed by repeated experience.

Of the Stock from which cuttings or layers are taken.

Every one knows, that it is of the greateſt conſequence to chuſe good ſtocks to take cuttings from, as the quantity and quality of the grapes, borne by the young vine, will greatly depend on it.

The white ſets are very improper to plant, we know very well that they bear amazing quantities of grapes, but it is as certain that theſe grapes do not yield a good or ſound wine; for in the firſt place it retains the colour of the ſet, from which it is produced, and beſides it has no ſweetneſs; and ſtill farther, tho' theſe grapes are more numerous, yet are they ſmaller than the others; ſo that taking all things into conſideration, they do not yield more wine than the others, and what they do produce is of an inferior quality. For theſe reaſons, every attentive and intelligent Vigneron will be cautious of taking cuttings from ſuch ſtocks.

Some chuſe the red wooded plants to take their cuttings from, but they alſo are in the wrong, the beauty and ſize of the ſhoot leads them aſtray. If they would but attend to the yield of the young plants produced from ſuch cuttings, they would ſee that they bore grapes with large thick ſtalks; that this ſtalk grows crooked at the place from whence the grape ſprings; that it ſprings horizontally from the ſhoot, ſometimes even the ſtalk and the grapes point up perpendicularly: this is to be attributed to the ſmallneſs of the grapes, their being few in number and their want of weight.

Let a diligent ſurvey be made at the vintage time, and the truth of what I advance will be very apparent. We may then conclude, that a red cutting is not proper to plant, if we would have a fine young vine.

How then are we to know a good ſtock from a bad one? It ſhould be of a cheſnut colour. It is neither very large like the red, nor very ſmall like the white; it holds the middle ſpace, both in point of ſize and colour. This is certainly the beſt ſtock to have a good vine from; but I would, by all means, recommend that when they are getting cuttings, it ſhould be from old vines, or at leaſt thoſe of a middling age, but never from young ones.

If by any accident, ſets have been planted from a bad ſtock, it will ſoon be perceived, in this caſe, the beſt way is, without delay, to root up thoſe plants that do not promiſe well, and put in rooted plants in their ſtead.

Before I proceed to another article, permit me in this place to make one remark.

How comes it to paſs, that in this part of the country we ſee ſo many ſeemingly fine vineyards, regularly planted, ſupplied with vigorous fine vines, in appearance, which yet yield very little wine in compariſon to what does another neighbouring vineyard, which is yet deſtitute of all theſe ſeeming qualities? This queſtion, ſay they, may be eaſily anſwered; it is becauſe one is from a better ſtock than the other. I acknowledge it; but why are any of our vineyards planted from bad ſtocks? In my humble opinion, it proceeds,

1. From people's not giving themſelves the trouble of enquiring of their experienced neighbours, which are the beſt ſtocks to take cuttings from; every one acts in this matter according to his own idea, though he knows nothing of the matter.

2. People will not, I mean in general, take theſe cuttings themſelves. What is the reſult?

3. They truſt to others, who either have not knowledge in a matter of ſuch importance, or who, if they have knowledge, do not take the trouble of chuſing properly; and wherefore? Becauſe being paid only at the rate of five or ſix-pence a hundred, they cannot get enough in a day, to pay them for their time; it is impoſſible they ſhould do ſo, at leaſt if they chuſe only what are good.

4. Beſides, this work is ſometimes truſted, nay very often, to perſons of no integrity, who, not content with cheating thoſe who employ them, by taking all that come under their deſtructive knife, and falling without mercy on the youngeſt plants, and thereby disfiguring them; this is not all I ſay, for with grief I muſt declare the truth, the government permits an open trade to be carried on in cuttings of vines, and to whom is this permitted? To people who are not poſſeſſed, as proprietors, of an inch of land, and of courſe muſt be thieves who deſerve puniſhment.

However, thanks be to God, this evil is not general. In ſeveral diſtricts, people are prohibited from making cuttings in any body's ground but their own. It is to be hoped, this good example will be followed elſewhere, and that regularity and order, will take place of licentiouſneſs and vice.

Having pointed out the ſources of theſe evils, it will be no difficult matter to adapt proper remedies. I ſhall ſay a word or two on the ſubject.

We ſhould, as much as poſſible, make ourſelves acquainted with the quality that a good vine ſtock ſhould be poſſeſſed of, and for this purpoſe conſult men who have had long experince in the matter. When this is done, we ſhould ourſelves collect, if poſſible, all the cuttings we may have occaſion for, without truſting to others, who will neither have the ſame care, nor indeed can they have the ſame motives for care as we have.

But as it is not poſſible we ſhould collect them all ourſelves, either for want of leiſure, or ſufficient knowledge in the matter, we muſt be ſometimes obliged to truſt this affair to others.

When this is the caſe, 1. Let us truſt this work to men who having long worked in vineyards, may be preſumed to know how to make a proper choice.

2. Let them be men of known probity. Be ſure to diſtruſt thoſe who may ſay they gathered ſo many cuttings in ſuch a time. Thoſe who take the moſt time, and gather leaſt in number, are the men you can moſt depend on.

The Seaſon for planting Vines.

As to what relates to the ſeaſon for planting vines, it appears to me, it may be done with the greateſt aſſurance of ſucceſs betwixt Martinmas and Chriſtmas. With regard to the ſeaſon, it is the ſame thing whether cuttings or rooted plants be made uſe of, and that for the following reaſons.

1. People have more leiſure in autumn than in the ſpring.

2. The cuttings planted in autumn, are in no danger of being overtaken and ſpoiled by droughts, which is frequently the caſe with thoſe planted in the ſpring.

The Method of planting Vines.

As to the method of planting vines, what is principally to be taken care of, is the diſtance that is to be preſerved from plant to plant, for with regard to the depth, it muſt be regulated by the depth of the ſoil.

I am firmly perſuaded that in planting a vineyard, the plants ſhould be placed at leaſt three feet diſtance one from the other, particularly if the ground lays on a flat. My reaſons are as follow:

1. The young vines grow thereby much larger and finer; and in cutting the vine, it may be made to ſpread or grow high, as the Vigneron pleaſes.

2. There is no danger of their branches being ſtunted, and growing buſhy, which is an ugly ſight when they are full leaved.

3. The branches of the vines are leſs in danger of being injured, and look handſomer: It is only neceſſary to behold thoſe vineyards, where the plants ſtand ſo cloſe as almoſt to touch each other, ſo that you cannot paſs through the rows without rubbing againſt them, when the young ſhoots are made, and as they are very tender, of courſe breaking them; this occaſions a very conſiderable loſs, for when theſe ſhoots are broken off, they are entirely loſt, and of courſe the fruit they would in all probability have borne.

4. If you place your plants at a ſmaller diſtance than that I have above-mentioned, you will find that the culture of the vineyard will be much more difficult and troubleſome; in digging between the rows, the workmen tear their cloaths, ſcratch their arms, and in fact, work in continual torture; whereas at the diſtance I have recommended, which I conſtantly obſerve, and with the greateſt ſucceſs, all this trouble and loſs is avoided.

5. It is very evident that the produce will be much more conſiderable, and particularly the wine will be without compariſon better; for every day's experience confirms it to us, that in vineyards where the plants ſtand too cloſe together, the grapes almoſt always rot before they attain a perfect maturity.

What is to be done in this extremity? the grapes muſt be gathered, and what are they? either grapes not half ripe on account of the ſhade the plants mutual caſt, or rotten from the ſame cauſe. And what ſort of wine is produced from theſe grapes? It is heavy, raw, and very improper for keeping; whereas in vineyards, where the plants ſtand at the diſtance I have already recommended, the grapes attain a perfect maturity, grow much larger, and are never rotten before they are ripe; and the ſun darting on them all his genial beams, they produce an excellent wine.

Rooted Plants to be prefered to cuttings.

Which are to be prefered, rooted plants or cuttings? To this queſtion I ſhall, in a few words, give an anſwer, which I ſubmit to the judgment of the intelligent.

In my opinion, rooted plants are much to be prefered to cuttings, particularly on ſtrong land. The moſt promiſing plants are eaſier diſtinguiſhed, they always take better and bear ſooner.

When a vineyard is to be planted, it would be too much to expect to have a ſufficiency of rooted plants made with little baſkets in the vines, or in the manner hereafter deſcribed. Every one knows the method of making rooted plants.

You are to plant cuttings at half a foot diſtance from each other, in good land well prepared for that purpoſe; they muſt be kept clean, and when at the end of two years they are taken up, great care muſt be taken that they are not damaged; and if any of them are defective, they are to be thrown away.

But if you would have your vineyard ſoon in full bearing, and would alſo have rooted plants to ſupply the place of the young plants that may have failed, or even the old ones, the following is the method I have of procuring them.

Method of procuring rooted Plants.

I cauſe ſome turf to be taken from a meadow in pieces a foot ſquare, and about two or three inches thick, which I lay down by the ſide of a plant, come from a good ſtock. At the depth of half a foot, I lay on this turf, turned upſide down, a ſhoot of the vine, which I cover with three inches of mould, leaving two buds of the ſhoot out of the ground, and cutting off with a knife all the buds from the ground to the plant it ſprung from.

If I am inclined to preſerve the branch of the plant, the ſhoot of which I lay down, I leave on it the firſt bud; and if the ſhoot puſhes forth any unexpected branches, I take care in the ſpring to cut off all between the plant and the earth.

The following year I cut off the ſhoot that was laid down near the earth, and afterwards cut it cloſe to the mother plant; if I left one bud, I alſo cut off the ſhoot it has made near the branch.

When this is done, I diſengage the turf on which is the rooted plant, and take all up together with a ſpade, carrying it to the place I had prepared for it to ſupply a vacancy, either in an old vineyard, or in one lately planted, taking care to dig a deep hole, and to put under the turf a foot of earth, a buſhel of new mould, either of turf rotted for this purpoſe, or of earth taken from the drain of a meadow, which has been mixed with dung to meliorate it. In a ſhort ſpace of time the empty ſpaces are furniſhed with good plants. This method of procuring rooted plants is in my opinion preferable to the uſe of baſkets for this purpoſe, there is, however, no great difference.

These rooted plants are of great uſe for ſupplying the vacancies in old vineyards; and I cannot, without concern, ſee the Vignerons, when ſome plants have failed in a newly made vineyard, wait for ſupplying their places till the vineyard is in a condition of ſupplying layers. Experience teaches us, that nothing hurts the vineyards in this part of the world more than taking many layers from them, they being either taken with too little attention, or elſe our ſoil is not adapted to produce them.

Method of manuring Vineyards.

I cannot in this place forbear mentioning a method I practiſe of manuring my vineyards; it is ſomewhat ſingular, and I do not propoſe it as a method that can be every where practiſed.

I pare off the turf of a meadow in ſummer time, that is to ſay, after the graſs is mown, and the hay got in, to the depth of about two inches. I lay this in a heap, till the graſs is rotted, which happens about autumn: I then have the heap ſtirred and turned, and leave it to be pulverized during the winter.

In the following ſpring I have this heap carried on to a piece of old or new vineyard, which ever moſt wants manure: I then ſpread it, taking care that it covers no more ground then it did in the meadow: I believe this method to be greatly ſuperior to laying on common dung, and repeated experience gives me reaſon to believe ſo.

An old vineyard manured in this manner, whoſe ſhoots have been ſmall and half dry, ſo that nothing could be expected from them, has been ſo much improved, and the following year the change has been ſo great, that the plants could ſcarcely be known for the ſame. Beſides, I have remarked, that the crops of vineyards, thus manured with rotted turf, have been much larger. And as for the quality, every body knows that the wine produced by a vineyard that has been dreſſed with dung, is generally heavy, raw, inſipid, and not proper for keeping, and it is alſo ſubject to be ropy: whereas that produced by vineyards, that have been manured with rotted turf, is fine, briſk, ſtrong, ſweet and ſparkling.

But ſay they, you build with one hand and deſtroy with the other; what muſt we deſtroy our meadows? ſurely this is abſurd.

So far from deſtroying the meadow, I conſiderably improve it. In the firſt place it is evident I deſtroy all the weeds, and that in an effectual manner; for immediately after the turf is pared off, I plow the meadow to the depth of ſix inches, and leave it in this ſtate during the winter. In the ſpring I take as much dung as I ſhould have laid on the vineyard, with this I manure my meadow, and ſow on it afterwards hay ſeeds, which I cover with a ſpade about an inch and a half; I do this part of the work very leiſurely, that I may ſpread the ſeed as regularly as poſſible. When this is done, I ſow ſome Dutch clover, and taking a rake level the mould, at the ſame time covering the clover ſeed. By this management I get two good crops of hay in a year, whereas had I left the turf on, I ſhould have had but one.

Of the Culture or Tillage which Vines require.

It is now neceſſary I ſhould ſay ſomething of the tillage which vineyards require, and in this matter I differ in judgment from other Vignerons.

It is aſtoniſhing to me, that in the great length of time in which we have cultivated vines, that no one ſhould have diſcovered that the beſt ſtirring that can be given them, is, if I am not greatly miſtaken, in autumn; from the vintage ſeaſon, till Chriſtmas; and at this time labourers are to be procured at a reaſonable rate.

They greatly err, who imagine that by this ſtirring the cold is let into the earth, and that the vines are thereby expoſed to the froſt. A long experience has convinced me, that this ſtirring, far from expoſing

poſing them to the froſt, preſerves them from it, particularly if they are at that ſeaſon manured.

The froſt has ſometimes come on immediately after I had done digging, yet I never found that it in the leaſt damaged my plants, on the contrary, fewer of them were frozen than in other vineyards which had not been tilled in autumn. But the advantages to be reaped from this practice are conſiderable.

1. Can any thing be better adapted for deſtroying all kinds of weeds?

2. The dung which is then laid on the land, warms it in the winter, mixes with the earth, nouriſhes and ſtrengthens the roots of the plants, and makes them fruitful; every part of it tends to profit; whereas that which is laid on in ſpring, is frequently a great part of it loſt, by being carried beforehand in ſmall parcels into the vineyard; here it dries and evaporates, before it is buried in the ground; this was the caſe in 1761 and 1762, when the north wind blew the whole ſpring, and the ground could be but very ſlowly dug, on account of its being ſo hard. To this we may add, that when the ſecond digging comes ſoon after the firſt, the dung is again brought to the ſurface and loſes all its ſubſtance.

3. The ground being thus looſened in autumn, imbibes more eaſily, and in greater abundance, the ſalts which the air, the ſnow, and the rain, communicate to it during the winter, it is a ſponge which loſes nothing, and this is undoubtedly of as much ſervice to it as dung.

4. The ſpring digging becomes thereby much eaſier to be executed, ſtrong lands become looſe and manageable, ſo that one man can do the work of two, an advantage ſo much more to be conſidered, as labourers are then at high wages, as we have lately experienced, when many Vignerons, notwithſtand-

ing the fineneſs of the weather, were ſurprized by the leaf before they had broke up all their vineyards.

5. The next advantage reſulting from this practice, is of more worth than all the reſt. Is it not evident, that a vineyard being clear from weeds in the ſpring, will not be impoveriſhed by feeding ſuch a number of noxious plants, which exhauſt it to the great detriment of the vines which have only the ſlender remains? For every one knows, that moſt vineyards when they are dug, are like graſs fields, and that frequently they are obliged to pull up the graſs before the ſpade, ſome of which having already ſeeded, the ſeeds ſprout a-freſh, and give a new crop; beſides, towards the end of Auguſt, and in September, they are obliged again to go over the vineyards, at the time the fruit is ripening, to pull up the graſs, leſt it ſhould contribute to rot the grapes before they are arrived at a due maturity. In pulling up the graſs at this time, they cannot but greatly damage the grapes, which are then very tender.

6. Finally, if there comes a froſt in ſpring, when the vines have put forth their buds, this autumnal ſtirring will prevent the white froſt from taking hold of the plants, which will alſo be helped by the heat that exhales from the looſened ſoil. This ſingle benefit, will repay the Vigneron all the expences he may be at on this account, for ſeveral years.

Many Vignerons laugh at me, when they ſee me doing this work. What, ſay they, muſt we dig our vineyards immediately after the vintage, let the cold into the ground, bring on expences out of time, and before we have ſold our wine? What folly is this?

Others, however, whether influenced by example or reaſon I know not, have adopted this method, and I am well perſuaded they will never drop it again.

[The original Editors in this place make the following remark. If the ſlope of the vineyard is any thing conſiderable, may we not apprehend that the looſened earth will be carried away by the rains, which fall plentifully the latter end of autumn. If the vineyards are leſs on a ſlope, or nearly on a flat, and if the waters of that wet and rainy ſeaſon, when the evaporation is leſs, ſhould fully penetrate the looſened and ſpungy earth, is there not reaſon to apprehend that the December froſts, falling on this moiſtened ſoil, will kill the plants? Should the vines be cut when this autumnal ſtirring is given, as was tried near the lake of Biene at Douane? We could wiſh the writer of this eſſay would make new experiments in order the better to reſolve theſe difficulties.]

It would, however, be juſt, that the proprietors, in order the more to excite the courage of the Vignerons, ſhould aſſiſt them in ſupporting a part of the expences of this culture, at leaſt, till the Vignerons ſhould by experience be convinced, how very advantageous this autumnal ſtirring would be to them; and I would adviſe all who may attend to my counſel to dig deep in autumn, thereby providing againſt what will undoubtedly happen in the ſpring, when the labourers will baulk the work, on account of the grounds digging eaſily: I would alſo adviſe them to give, nevertheleſs, to their vineyards, the three uſual ſtirrings at the proper ſeaſons.

Let them eſteem it the moſt eſſential part of their culture to keep their lands clear from weeds, which impoveriſh it greatly, and that at the expence of the vine plants, ſo that they cannot be too effectually deſtroyed. Finally, the frequent ſtirring of the ground makes it work better, ſaves dung, and is, with the bleſſing of God, the principal ſource of plentiful crops.

An

An Obſtacle to the due Culture of Vineyards.

I ſhall not in this place paſs over an obſtacle I diſcover to the due culture of vineyards. It ariſes from too many acres being truſted to the care of one ſingle Vigneron. I have obſerved that Vignerons, who had under their care ſeven or eight acres of Vineyard, have not made more wine than thoſe who had only four acres. Whence can proceed this aſtoniſhing difference? It is not very difficult to account for it. In my apprehenſion what follows is, at leaſt, in a great meaſure the cauſe to be aſſigned.

A Vigneron, who has too much ground on his hands, cannot beſtow on his vines the quantity of tillage they require. He can only dig them once a year, and that but ſlightly; he only, as it were, ſcratches the ground, and how ſhould he find his account in it? Yet muſt he feed his workmen.

Shall we ſay that he ſhould employ labourers enough to dig his vineyard, at leaſt twice a year, and that regularly. But, beſides that workmen are not always to be had, this calculation will be found erroneous; for experience every day convinces us, that the more numerous the workmen are on a vineyard, the more they eat, and the leſs work they do. I have ſeen a band, conſiſting of eight or nine, and another of only four; and I have obſerved, with great aſtoniſhment, that the laſt had done more work at the days end than the others; the reaſon is, that in theſe numerous bands, where you have one good diligent workman, you will find ſeveral who chatter away half their time, and whilſt they are talking, they muſt be upright; for they will tell you, they cannot do two ſorts of work at the ſame time: and whilſt they are ſtanding upright, the work ſtands ſtill, yet they have not a whit leſs appetite at meal time: thus is the poor Vigneron infallibly ruined. He has too many mouths to feed, and too few hands at work.

If I am aſked what quantity of vineyard ſhould be given to one Vigneron, I ſhall not diſſemble my opinion; I think that a ſenſible proprietor will not let, at moſt, above four or five acres of vineyard to one Vigneron. It is better to have ſeveral, and will be more advantageous both to the landlord and tenant; as to the number of workmen, I think it beſt never to have more than three or four together, the reaſon for it is, their attention will be leſs drawn off, and of courſe they will apply with more diligence to their work. I do not, however, pretend, that my advice ſhould have the force of a law; let every one do what he thinks beſt, but I can ſay with the greateſt degree of truth, that I conſtantly follow this practice, and that I thereby reap very conſiderable advantages.

The reader will obſerve, that I only ſkim the ſurface of the ſubject; to ſay all that could be ſaid reſpecting the culture of Vineyards would fill a large volume. But this is not my preſent deſign. A great deal might be ſaid on the method, ſeaſon, and perſons proper to thin the leaves of vines.

ARTICLE XLVI.

An Eſſay on the Culture of the African Millet, Sorghum, milium nigrum. *Written by Mr.* TSCHIFFELI.

THIS Millet is a plant which merits the huſbandman's utmoſt attention, and that for the following reaſons:

1. It thrives in all ſorts of ſoils.

2. It neither requires much dung, nor a great deal of tillage.

3. It is not ſubject to the depredations of birds, which are very fond of panick and common millet.

4. It yields very large returns.

5. Laſtly, it does not exhauſt the land in proportion to the largeneſs of the crops.

The ſeed of this ſort of millet comes originally from Africa, where it ſupplies the inhabitants with food, as with us bere, wheat, and other grain. But they are miſtaken who thence conclude, that it will thrive only in hot countries.

Providence has endowed it with ſuch excellent qualities, that it may, with ſucceſs, be cultivated in countries much colder than Switzerland.

The firſt ſeed of it I received was from Mr. Engel, magiſtrate of Echalens, whoſe attention in promoting the improvement of Agriculture is well known. He had procured it from Pomerania, it being ſent to him by the celebrated Doctor Schreber, in the ſpring of the year 1760. I had from him about a ſpoonful.

In the month of May of the ſame year, I ſowed it on a gravelly ſoil, hard and ſtony, very much expoſed to the north wind, and which the year before had borne ſome very indifferent bere.

In the month of February preceding, ſome human ordure had been laid on this land; and in May, the clods were all broken before the ſeed was ſpread.

Having ſo ſmall a quantity of ſeed, I took care to ſpread it very thin, and to this do I aſcribe the ſtalks running to the height of eight feet and more. The ears were above ten inches long, and I am perſuaded, that if a ſhower of hail had not fallen on it, the ſpoonful would have produced me at leaſt a peck.

I reckon this accident occaſioned the loſs of half my ſeed; I had, however, enough left to divide with my friends in Switzerland, as well as elſewhere.

In the month of May 1761, I ſowed about a quart of ſeed, or near a pound, on ſome land, from which I had firſt pared off the turf, and afterwards burnt it. The ſpace on which I ſowed the ſeed was about twenty paces long, and ten broad.

Sometime before harveſt I perceived I ſhould have allotted three times as much ground for that quantity of ſeed. The ſtalks, which were very cloſe, were interwoven one with the other like the hairs of a bruſh. They were ſcarcely five feet in height, and the ears alſo were much ſhorter than the preceding year; this, however, did not prevent my reaping about ſeven pecks, or above fifty for one. This year, 1762, I ſowed about four pounds of ſeed, or about half a peck, on ſome pretty good land, being in quantity about thirty ſquare rods or perches.

Laſt year the ſame land bore potatoes, and as I had laid on no freſh manure for the millet, and had neglected to plow it before the winter, for it was only turned over with a ſpade before ſowing, I imagined I had not ſown the ſeed too thick: but in this I was greatly miſtaken.

The millet came up almoſt as thick as the year before, and I had not the courage to thin it, which would have been right, the ſtalks and ears were ſhorter than the firſt year.

Notwithſtanding this, by the goodneſs of providence, I was enabled to reap twenty buſhels, being 640 pounds, of courſe a return of 160 for one.

There can then be no reaſon to doubt, but that moderate land, ſown thin, and properly prepared, will produce, one year with another, 100 buſhels of millet per acre. For I got as much in proportion, tho' my land was but ſlightly tilled, and I manifeſtly ſowed my ſeed too thick. This is certainly a moſt wonderfully encreaſe, in what light ſoever we behold it.

What grain have we, which in our fields will yield a return of 150 for one, and which, at the ſame time, will ſell ſo well, for in price it is on a footing with wheat? It is true, it yields a heavy, crumbly and indifferent bread, but if it is made into pottage, it is excellent, very nouriſhing, and of exquiſite flavour. Not only my ſervants and workmen are very fond of millet thus prepared, but I myſelf prefer it to the beſt rice, which will not grow in this country, and comes at a much higher price.

The millers, whoſe reputation is not of the beſt, return you a good third of a buſhel of millet meal for every buſhel you ſend them, after deducting toll, bran, waſte, &c. Now I know by experience, that this quantity, when it is made into pottage with milk, will ſerve at leaſt fifty men for a meal. Surely they cannot be fed at a cheaper rate.

In times of ſcarcity millet muſt be of great uſe, as with the addition of potatoes the poor might live comfortably.

I will with great pleaſure ſupply thoſe with ſeed who cannot conveniently afford to buy it.

An acre of land requires, at moſt, but ten pounds of ſeed, and I can, from my own experience, venture to aſſert, that millet does not impoveriſh land in proportion to its produce. The land I ſowed in 1760 and 1761 yielded the following year fine plants of Dutch clover, and rey graſs in as great plenty, with reſpect to the crops, as the neighbouring land.

ARTICLE XLVII.

An Example of the Partition of a Common in Switzerland, written by M. DE WERTH, LORD OF TOFFEN, *Member of the Supreme Council at Berne, and chief Magiſtrate of Vevay.*

THE diſadvantages attending commons, are pretty well known, but a remedy may eaſily be applied.

As every place has its particular cuſtoms, no general rule can be framed, but on my eſtate, I managed in the following manner.

The peaſants, or labouring people, who had no land of their own, had long requeſted that a partition ſhould be made, or at leaſt, that every one might have an acre or two of land. They always, however, failed of ſucceſs.

It is to be obſerved, that on the one hand I loſt many families who left a place where they had no poſſeſſion, and on the other hand, the requeſt of theſe people was very reaſonable.

I told them to draw up a petition to me, and ſign it. This was done, and ſigned by the greateſt part of them. They concluded, with requeſting that each maſter of a family ſhould have two acres of land.

I aſſembled together the inhabitants of the place, and told them that their relations and neighbours requeſted, that they might each have a ſmall portion of the common allowed them, and I aſked them whether they would pay any attention to this requeſt,

queſt, and ſubmit the deciſion to the plurality of voices.

The richeſt of them oppoſed it, and having collected the votes, two thirds were for the partition, but the remaining third part abſolutely refuſed it.

I told thoſe who were for the partition, that if they thought they had a right, their only way was to petition properly for it. They then addreſſed themſelves to me as their judge. Three fourths were now for the partition, but the other fourth oppoſed it.

After having heard their reaſons, and read ſeveral papers on the ſubject, I pronounced ſentence, in which, after mentioning the general reaſons for ſuch a partition, I laid it down as a principle, that the property of the common was veſted in me, as being the Lord, and the uſe of it belonged to the townſmen; that when the Lord and the majority of the townſmen, agreed for their greater convenience, to enjoy the uſe of the common in any particular manner, this ſhould of courſe be ſubmitted to; for theſe reaſons, I allotted to each father of a family, one acre and an half, inſtead of two, which they requeſted, ſo that above half the common was ſtill left for general uſe, and in this the rich had greatly the advantage.

This piece of land for each, was only to be for life, without the power of alienating, mortgaging, or changing it in any ſhape whatever. The number of theſe portions was always to be the ſame, ſo that if there ſhould hereafter prove to be fewer fathers of families, than portions, the ſurplus was to be let for the benefit of the poor; when there are more fathers of families than portions, ſome are to wait till the portions become vacant.

I will not conceal the reaſon I had for making this regulation, it was founded on the repugnance which I knew they had to admitting any body free of their townſhip; if by the extinction of the heads of any families, the vacant portions were to have been annexed to the common, they would with this view have never admitted any body free of their townſhip. They would have been ſtill leſs inclined to admit any, if a portion of land from the common was to have been immediately aſſigned to the new comers.

With regard to the revenues of the poor, which muſt of courſe be diminiſhed by the vacant portions being occupied, this may be made up by the fines on admittance to a freedom, which fines ſhould be applied to their uſe.

The unhappy diſpoſition of moſt of our cities, towns, and villages, of not receiving new freemen, is one cauſe of depopulation, and one of their ſecret motives is, that they may keep to themſelves the enjoyment of the commons.

It appears to me, as if the greater part of our commonalties and corporations were ſo many Tontines, where the ſurvivors hope to be benefited by thoſe who die, ſo that if we once adopt this ſyſtem of dividing commons, the principal obſtacle to the reception of new freemen, will in many places be removed.

The more wealthy peaſants appealed from my ſentence, which was pronounced in September 1761, but as they did not proſecute their appeal within the limited time, it was of courſe dropped.

In April 1762, I proceeded to execution; I cauſed as many portions of an acre and a half to be ſet apart, as there were families. I aſſembled all the commonalty on the ſpot, and deſired that ſuch as were willing to have portions, ſhould declare themſelves. Four parts out of five, then declared for a diviſion. The others proteſted; I cauſed all thoſe who were willing, to draw lots, and every one had his lot, according to the number that referred to it

I felt, at that inſtant, a very ſincere joy, to behold the tranſports of theſe poor people, and to hear the bleſſings and thanks which they heaped on me.

As for the others, though I ſet apart their portions, they carried their clamours to the ſtates; who, as uſual, refered the matter to the conſideration of a committee, where the opponents did all that art or cunning could ſuggeſt to fruſtrate my ſcheme.

They began by diſputing with me the property of the common. I produced my title deeds to the Lords of the œconomical council, who, by the unanimous and favourable report they made to the ſenate, obtained for me an abſolute confirmation of my rights, in conſequence of what was contained in my title, and the poſſeſſion which had never been diſputed with me.

After this the thing was ſo plain, that the only queſtion was whether my ſentence ſhould remain in force or not; but the opponents demanded a view, upon which the Lords of the committee took the trouble to go to the place, and having found every thing as my ſentence expreſſed it to be, they had the goodneſs, in order to put a final and ſummary end to the affair, to offer their mediation, and an abſolute arbitration.

All parties accepted of this offer with joy and thankfulneſs: my ſentence was taken for the baſis, and confirmed in all points, except that inſtead of an acre and an half, they allotted only one acre to each family.

In other reſpects my rights were unimpeached, and in particular this principle was firmly eſtabliſhed; that in future, if the Lord, as proprietor, and the greateſt part of the freemen, are of one mind, it is to ſerve as a rule with reſpect to the partition of commons.

This ſentence was afterwards ratified by their excellencies the ſenate.

This affair was in ſuſpence till the month of June, and there being an order iſſued, that the land ſhould not, in the mean time, be either plowed, or otherwiſe cultivated, it is not to be ſuppoſed it could be much mended. Notwithſtanding this, they had a load of hay from each acre, including the firſt and ſecond crops, and they told me, they hoped next year to have a load and a half. Now as two loads will winter a cow, either by buying half a load more, or getting a piece of land that will yield it, they may keep one, with this view I offered to advance them money for the purpoſe. All the ſummer the cow may go on the common. This cow may ſupply the whole family with food, and with what they can beſides earn, they may live tollerably well.

The family being in this manner attached to the ſpot, will neither emigrate nor ſink into poverty, and this is what I principally aimed at.

From this example, which I have the honour of laying before this illuſtrious ſociety, it is evident that by proceeding from ſmaller matters to thoſe of greater moment, all the commons may be ſo divided, by which means population will encreaſe, agriculture will be more flouriſhing, and this cannot but add to the riches and happineſs of our country.

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